Metals Review

THE NEWS DIGEST MAGAZINE

Published by the American Society for Metals

Volume XXIV - No. 11 November, 1951

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Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXIV, No. 11 **NOVEMBER, 1951**

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; John Chipman, President, Ralph L. Wilson, Vice-President: William H. Eisenman, Secretary; R. L. Dowdell, Treasurer; J. B. Johnson, George A. Roberts, James B. Austin, James T. MacKenzie, Trustees; Walter E. Jominy, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

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DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

In These ASM Books on Metallurgy . . .

TODAY'S AUTHORITIES PROVIDE YOU WITH THE BACKGROUND FOR BECOMING TOMORROW'S AUTHORITY

The best approach toward an outstanding performance as a metallurgist is confidence based on researched facts. Here are basic facts–brought up-to-date by experts–for your practical use.

Atom Movements

This book contains the formal papers presented at the annual Seminar given under the auspices of the Society and arranged through the ASM Seminar Committee consisting of the following members: Clarence Zener, Chairman; J. B. Austin, R. M. Brick, Morris Cohen, Maxwell Gensamer, J. H. Hollomon, L. R. Jackson, L. K. Jetter and Don McCutcheon. The two-day meeting, which preceded the opening of the 32nd National Metal Congress and Exposition in Chicago, was attended by over 500 leading metallurgists and physicists of this country.

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Interpretation of Tests and Correlation With Service

Another volume published as the result of the ASM Educational Lecture Series held in Chicago during the 1950 Metal Congress.

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Laboratory Fatigue Tests on Standard Specimens. The purpose of this lecture is to show that a definite correlation between laboratory tests and service performance of automotive components does exist. Of the authors, M. F. Garwood is Chief Metallurgist and H. H. Surburg is Assistant Chief Metallurgist, Chrysler Corporation, Detroit. M. A. Erickson is Head, Stress and Strain Laboratory, Dearborn Motors Corporation, Birmingham, Mich. Limitations of Mechanical Testing. Maxwell Gensamer, Professor of Metallurgy, Columbia University, discusses, (a) Behavior in a Specific Service; (b) Effects of Certain Variables on Mechanical Behavior; (c) Degree of Uniformity of a Product. Wear Tests and Service Performance, by J. T. Burwell, Associate Professor of Mechanical Engineering, Massachusetts Institute of Technology. Corrosion Tests and Service Performance, by F. L. LaQue, Head, Corrosion Engineering Section, International Nickel Co., Inc.

198 pages .... 6 x 9 .... red cloth $5.00

High-Temperature Properties of Metals

This volume contains five lectures given during the ASM Educational series held in Chicago at the 32nd National Metal Congress in 1950.

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Newspapers and Technical Press Tell Story of Metal Congress

To characterize the 33rd National Metal Congress and Exposition and the concurrent first World Metallurgical Congress as an "unqualified success" or a "new high" would be a mere banality in the face of the great interest and enthusiasm engendered.

The wide possibilities for international cooperation opened by the first World Metallurgical Congress, together with the record-breaking aspects of the 33-year-old National Metal Congress and Exposition, have been expressed variously and repeatedly in the public and technical press during the past few weeks. For those who missed some of the events they wished to see or hear (and it was humanly impossible to participate in all of the hundreds of events cramming the week), Metal Progress *has devoted a large part of its November issue to the combined activities.*

Metal Progress *reproduces in full some of the important papers presented at the opening and closing sessions of the World Metallurgical Congress. These include several talks at the keynote meeting on "World Metal Resources", the closing address on Friday by ODM's Charles E. Wilson, and Secretary Eisenman's farewell remarks that gave rise to the heartiest ovation of the week. President Truman's proclamation endorsing the Congress is reproduced, and some brief notes on one of the group discussion meetings show how this phase of the program was operated.*

The Metal Show was thoroughly explored by M. P. *associate and consulting editors, and a few highlights of their impressions are published, together with accounts of their participation in some of the plant study tours arranged for the overseas conferees. Dr. Lorig's Campbell Lecture on "A Metallurgist Looks at Fracture" is also presented.*

In view of this comprehensive coverage, Metals Review *will confine its attention to a few story-telling photographs, and a sampling of what others had to say in newspaper and technical press editorial comment.*

FOREIGN METALLURGISTS ADD ZEST TO METAL CONGRESS (Iron Age):

"Paced by the largest number of exhibitors in the 33 years of Annual Metal Show history, more than 45,000 engineers and scientists swarmed into Detroit last week. The first World Metallurgical Congress attended by conferees of 34 free nations set a new high standard for round-table technical discussion. Chartered buses shuttled between the downtown hotel headquarters of the four technical societies and the National Metal Exposition 8 miles away at the Fair Grounds, the day-round, all week, on 15-min. departure schedules.

"Technical discussions on every possible phase of metals and metalworking took place at the society headquarters downtown and at the Fair Grounds where 440 exhibitors welded, melted, cleaned, plated, machined and sold their heads off . . ."

ONE WORLD METALLURGY? A symposium based on interviews with a representative cross-section of the conferees *(Steel):*

"One world metallurgy is a high-sounding phrase, and perhaps is one on which the destiny of free nations may rest in part. From a practical standpoint it is probably little more than a distant dream, although the World Metallurgical Congress may provide the initial impetus toward making this dream a reality. . ."

WORLD CONGRESS OF IDEAS; Production and Engineering News at a Glance *(Steel):*

"For the first time in history an American technical society has gone all-out to assemble a representative worldwide group of engineers, metallurgists and technical experts in the metalworking field, with the idea of promoting an interchange of ideas on metals conservation and utilization in the light of today's conditions. It is perhaps entirely appropriate that Detroit should be the scene of the World Metallurgical Congress. . .

"Both ferrous and nonferrous plants, producing and fabricating, throughout the free nations of the world are wrestling with problems similar to those in the U. S.—shortage of metallics, insufficiency of skilled technicians and capable management, and demand for finished goods outrunning supply.

"Foreign conferees to the W.M.C., carefully chosen by their respective governments, with the aid of technical associations and institutes, have been touring U. S. industry, seeing at first hand the mass production techniques they have heard so much about. . . .

"A complete roundup of the congress and exposition, with its multitude of technical sessions, educational course, seminars and round-tables reinforced by 6½ acres of wares displayed by 400 exhibitors, will convince anyone that this is the 'bestest and the mostest' of the metal shows ever unfolded."

BOUNDARIES UNLIMITED By Tom Campbell, Editor *(Iron Age):*

"In free nations you can usually go to another plant and talk things over with someone in the same business as yourself. Unless it is highly competitive information in its early stage, you probably can have the freedom of the plant with all questions answered.

"Free men have always exchanged letters and papers on industrial progress. By mail and by business publications people abroad have kept abreast of recent techniques and advances. . . .

"Once in a while a group visits this country or one of our groups goes abroad. Much is learned besides the industrial angle. New friends are made. Better understanding results and a deeper bond of friendship is forged.

"Thanks to the enterprise of William H. Eisenman of the American Society for Metals, and the miracle

(Continued on page 8)

Highlights of Important Events

An Official "Welcome to Michigan" Was Given the W. M. C. Conferees at the Statler Hotel in Detroit on Sunday Afternoon, Oct. 14. Welcoming speakers were Governor G. Mennen Williams (Extreme left); W. C. Newberg, president of Dodge Division of Chrysler Corp. (right); and Detroit's Mayor Albert E. Cobo (not shown). Between Governor Williams and Mr. Newberg are W. M. C. Director-General Zay Jeffries; Bernard Jousset, of the Case Hardening Co. of Paris, France, who responded for the visitors; and A. S. M. President Walter E. Jominy

Below: President Jominy Presents the Citation Which Accompanied the Gold Medal Award to Paul D. Merica of International Nickel Co. during the A. S. M. Banquet on Thursday. In the background is Founder Member A. E. White, Who Introduced Dr. Merica

An Event of the Week was the Election of Dr. Jeffries, Director General of the World Metallurgical Congress, to Honorary Membership in the Japan Institute of Metals—the Only Honorary Member Residing Outside of That Country. Certificate of Membership is presented by T. Mishima, professor of metallurgy, University of Tokyo, leader of the Japanese W. M. C. delegation

At the Sunday Evening Meeting on "World Metal Resources", Fritz Engelmann Presents the Paper by K. P. Harten, Secretary of the German Iron and Steel Institute, on "Defense Metal Conservation and Substitution". Other speakers on the platform are (from left) Clyde Williams of Battelle Memorial Institute; James Boyd, U. S. administrator of defense materials; Pierre Van der Rest, general manager of the Belgian Blast Furnace and Steelworks Association

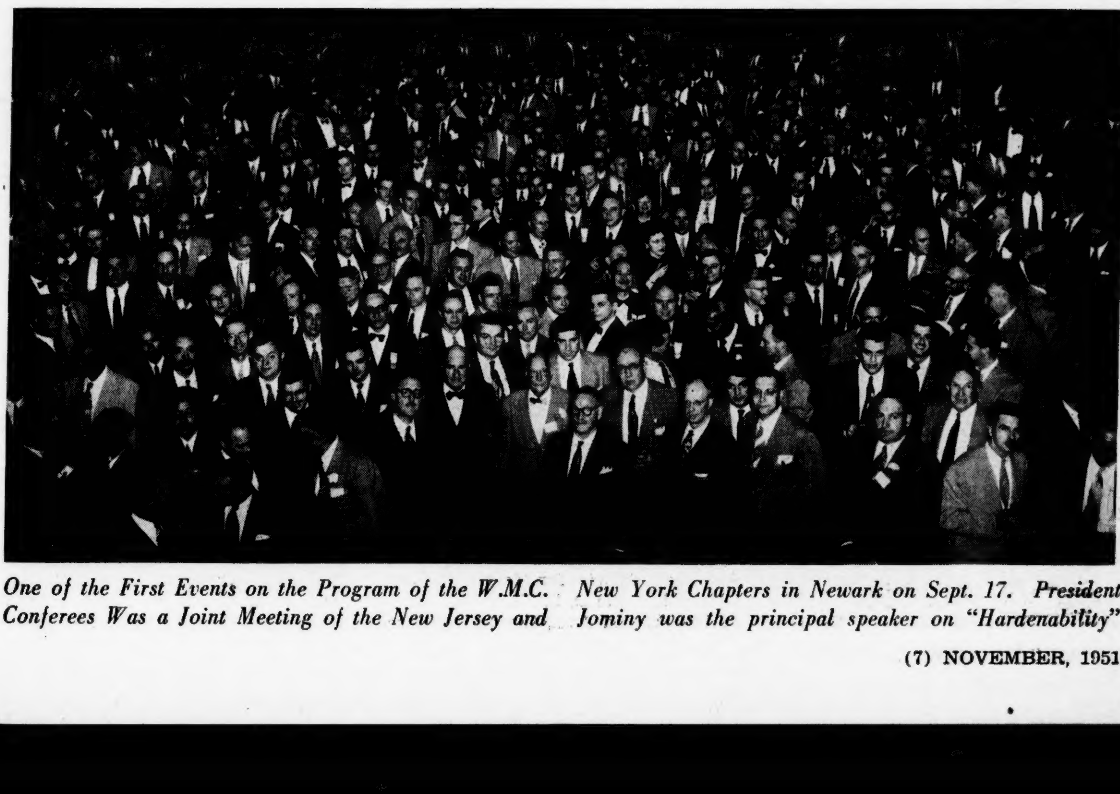
At Metal Congress in Detroit

ODM Administrator Charles E. Wilson, Who Presented the Address at the Farewell Dinner for the World Metallurgical Congress on Friday Evening, Is Seated Between Dr. Jeffries and President Jominy

Below: A. S. M.'s Incoming President John Chipman Chats With Reginald W. Blount of the British Ministry of Education at Farewell Dinner. Dr. Blount was spokesman for the departing conferees

Left: Secretary Eisenman Is Congratulated by Jominy, Who Has Just Conferred Upon Him the Only Gold Medal Struck for the World Metallurgical Congress. Mr. Jominy, Dr. Jeffries and Mr. Wilson received silver medals

Right: C. H. Lorig, Assistant Director, Battelle Memorial Institute Presents the Campbell Memorial Lecture Following the A. S. M. Annual Meeting on Wednesday



One of the First Events on the Program of the W.M.C. Conferees Was a Joint Meeting of the New Jersey and New York Chapters in Newark on Sept. 17. President Jominy was the principal speaker on "Hardenability"

work of Dr. Zay Jeffries, several hundred metal experts from abroad are in this country . . .

"Much has been learned by the visitors and much has been learned from the visitors by American metal experts. It has been a free exchange of industrial help and ideas. . . .

"Meeting people face to face is a good way to get acquainted. This is one big experience which will pay off—for both host and visitor. A good start has been made. The boundaries are unlimited."

FREE WORLD FRATERNITY. By E. L. Shaner, Editor-in-Chief *(Steel)*:

"Next week thousands of persons identified with metalworking will converge on Detroit for the 33rd National Metal Congress and Exposition. . . . There are indications that the Congress and Exposition will surpass all predecessors in interest and attendance. However, the feature that distinguishes next week's event from previous affairs is the first World Metallurgical Congress. . . . The associations formed by these visitors [several hundred metallurgists and metal production executives from 34 nations] during their trip and in the Detroit assemblies have tremendous possibilities. Such exceptionally talented conferees from so many nations of the free world cannot be in almost daily contact for six weeks without discovering common bonds of interest, erasing nationalistic misunderstandings and forming useful foundations on which to build constructively in the future. . . ."

REVOLUTION IN METALS Scientists Blazing Trail in Perfecting New Elements to Produce More and Tougher Steel and Iron Substitutes for Atomic Age, by William L. Sanders, Staff Writer *(Dayton Daily News*, Camerica Section):

"There's a revolution afoot in this country.

"While dictators spit at each other and at the United States, an army of American metallurgists is effecting an industrial transformation that eventually will become global. This army of scientists and technologists, unlike the dictators, is in step with the atomic age. It is engaged in a vast, constructive enterprise to promote the common welfare.

"The general headquarters (GHQ) of this army, the American Society for Metals (ASM), is in Cleveland. Units of this army, including the Dayton Chapter, will rendezvous in Detroit, Oct. 13-19. The first World Metallurgical Congress, sponsored by A.S.M., will bring together some 45,000 metal scientists from the free countries. Upon them will rest, in a very real sense, the destiny of free men. . . ."

THE METAL CONGRESS (American Metal Market):

". . . At the exposition, metal producers and suppliers have personal contact with consumers. Even in these days of unnecessary salesmen, when the orders just flow in automatically and may even have to be rejected, the meeting of buyers and sellers is important from a long-term view. Factors that market a product or service must preserve their identity and prestige so that they will be remembered clearly when a buyers' market returns. That is one big reason why many key men in the metal industry are in Detroit. Other reasons are to learn how to reduce costs, especially on alloys and fabrication, and how to find substitutes and to apply them. . . .

"This international meeting of metal scientists should help uncover new knowledge on trends concerning both resources and technology and also promote technical coordination to build a stronger and more friendly community of democratic nations."

CLEVELAND PLAYS LEADING ROLE IN FIRST WORLD METAL CONGRESS. By Robert Seltzer, Business and Finance Columnist (Cleveland *Press*):

"If, as expected, the first World Metallurgical Congress in Detroit next month contributes to stronger international ties during defense preparation for a more durable and secure peace, much credit will accrue to a Clevelander, an ex-Clevelander and a national organization headquartered here.

"The Clevelander is William H. Eisenman, executive secretary and founder of the 32-year-old American Society for Metals. Eisenman, 65, short, stocky, mustached, instituted plans for the world conclave in the two-fold interest of free world defense and world conservation of metal resources.

"Dr. Zay Jeffries of Pittsfield, Mass., retired vice-president of General Electric Co. and formerly of Nela Park here, made an extended European tour to interest governmental, industrial and scientific leaders in the congress.

"He is director general of the congress, past president of ASM, a renowned author and scientist, and is known as dean of American metallurgists.

"The organization, of course, is the American Society for Metals. Housed in the old stone D. Z. Norton mansion at 7301 Euclid Ave., the society rose to prominence as the world's largest publisher of industrial, scientific information. . . .

"Sponsored by ASM, the congress is expected to attract more than 40,000 metal engineers, research scientists and managing executives . . .

"The American Society for Metals publishes two monthlies. *Metal Progress*, edited by tall, gracious, graying Ernest E. Thum since its founding 21 years ago, is the 'engineering journal of the metal working industry.' *Metals Review* reports chapter activities and has an annotated index of current metallurgical literature, covering 800 national and international periodicals.

"A.S.M. has a staff of 35, and also publishes Metals Handbook, a reference source.

"Eisenman, born in Jamestown, O., formerly an educator, joined an A.S.M. predecessor in 1918 as national secretary. He brought the office here in 1920. The society has grown from one unit of 200 members to 80 chapters in the U. S. and Canada and more than 20,000 members.

"For 32 years Eisenman has directed the National Metal Congress and Exposition . . . . Eisenman first broached the subject of the world congress to Paul Hoffman, when the latter was director of ECA in January, 1950. Hoffman approved the project, but it was deferred until this year.

"Time was when John W. Gates could abolish the laboratory of his Chicago steel company and throw out 'all other useless research.' That was more than 50 years ago.

"Now every concern that processes metal has to have metallurgists or the equivalent. They are responsible for all the great advances we have made in the steels, from the high-speed steel of 60 years ago, to the '18 and 8' steels of the middle period, and the cemented carbides of the same period, up to the low alloys and the new metals of high melting points now in such demand for war materials."

VISITORS PRAISE U. S. METHODS. Special Report by W. G. Patton *(Iron Age)*:

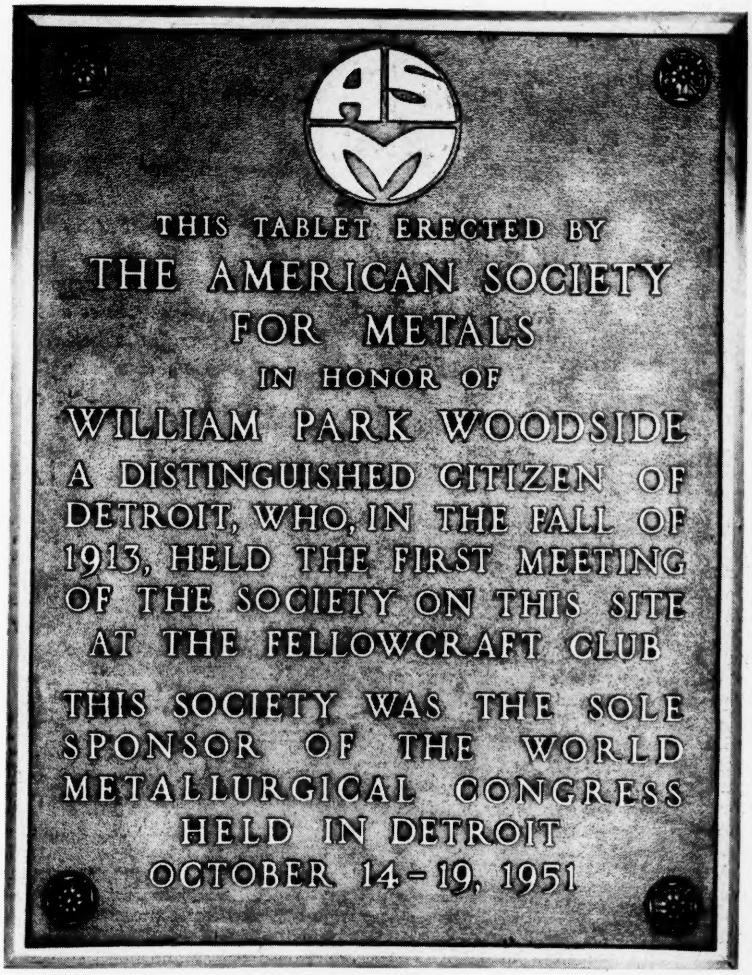
"The excellent cooperation within U. S. industries as exemplified by the country's technical societies and trade press is not available anywhere else in the world.

"Technical experts from other countries visiting America for the first time are amazed at the volume of goods produced, at the high productivity per worker and the precision timing of our assembly lines. They are also much impressed with the research programs being carried on by industry.

"These observations were made by conferees to the World Metallurgical Congress. . . ."

Dedication of William Park Woodside Plaque

On Sunday afternoon, Oct. 14, in Detroit, William Park Woodside, pioneer heat treater and venerable founder member of the American Society for Metals, was present at a ceremony dedicating a plaque in his honor. The plaque was installed on a wall of the Robinson Furniture Co. building, site of the first meeting of the Steel Treaters Club, forerunner of American Society for Metals, in 1913. Following is the full text of remarks by A. S. M. President Walter E. Jominy, at the dedication. Also present were the other two living founder members, W. H. Eisenman and A. E. White.



"This is the site of the first meeting of the American Society for Metals in 1913. Here men of vision with a desire to help one another and to forward the knowledge of metallurgy came together. They perhaps did not realize that so much good, so much help to others in their profession, so much help to mankind and a free world would develop from their early efforts.

"To Bill Woodside must be given the credit for gathering together this group of men. Many others gave freely of their time and energy and because of their wise planning a society was founded which has continued to grow and, what is more important, continued in their high ideals.

"These men were pioneers. Many of them were hardening-room foremen in the automotive industry, and methods of heat treatment used in their various shops were carefully guarded secrets. Some processes had come down to them from earlier generations of metal workers, some had been discovered by accident, and others had been developed experimentally.

"Each of these craftsmen knew one or more phases of heat treating well. Now they pooled their knowledge. As a result, all of the shops represented gained important trade information and the motoring public benefited because of improved manufacturing processes.

"The original name selected by the founders was the Steel Treaters Club. In 1915 technical members were admitted and the name was changed to the Steel Treating Research Club of Detroit. Later, executives also joined and, by the time the United States entered World War I, it performed an important function as a meeting ground for representatives of government and industry to discuss mutual problems.

"The remainder of the story is more familiar. The society began to grow and its interests were expanded to include all phases of metallurgy. In 1933 the present name was adopted. From that small group of 20, as the original nucleus, has come the present Society with some 20,000 members.

"Those of us who have followed these early founders have benefited much from the society which they formed. Our community and our country have also gained much from knowledge that has been disseminated through the society.

"We are therefore proud to place this plaque in respect to those who founded and carried forward the American Society for Metals.

"Mr. Brown (secretary of the Detroit Historical Society), as president of the American Society for Metals, I am glad to turn over to your custody this plaque erected on the site of our first meeting."

Mr. Brown acknowledged the custody of the plaque. Norman H. Hill, executive secretary to the Mayor, and Neal Cutliff, secretary of the Department of Public Works, represented the city of Detroit at the function.

Mr. Woodside, now chairman of the board of Park Chemical Co., retired in 1943 from Climax Molybdenum Co., where he was a vice-president. In 1913 he was district sales manager for Crucible Steel Co. in Detroit.

New Ferro-Alloy Plant Built

A new ferro-alloy plant built at Brilliant, Ohio, by Ohio Ferro Alloys Corp. as part of its expansion program to meet defense needs began operation on Oct. 3. The plant consists of three large, modern electric furnaces equipped to produce various grades of silicon alloys, ferrochromium, and other alloys.

Four Chapters Hear A.S.M. Trustee

Four Chapter Chairmen and an A. S. M. Trustee Were Prominent at the Annual ABCOR Meeting in Chattanooga. From left are Sam F. Carter, American Cast Iron Pipe Co., chairman of Birmingham Chapter; E. C. Miller, Atomic Energy Commission, chairman of Oak Ridge Chapter; J. T. MacKenzie of Birmingham Cast Iron Pipe Co., A.S.M. trustee and principal speaker; Frank F. Ford, manufacturers' representative, chairman of Georgia Chapter; and R. E. Lorentz, Jr., of Combustion Engineering-Superheating Co., Inc., chairman of Chattanooga Chapter

Reported by R. E. Lorentz, Jr.
Combustion Engineering Superheater, Inc.

The annual ABCOR meeting of A.S.M.—a joint meeting of the Atlanta, Birmingham, Chattanooga and Oak Ridge Chapters—was held in Chattanooga on Sept. 14. Appropriately enough, James T. MacKenzie, national A.S.M. trustee and director of research of American Cast Iron Pipe Co. of Birmingham, Ala., was the speaker.

Dr. MacKenzie answered several questions concerning the national organization and told of A.S.M. plans for the future. He then presented the technical talk on the role of "tramp" elements in the foundry.

Very small quantities of such elements as lead, tin, aluminum, copper, antimony and zinc can result in castings of poor physical properties or excessive porosity, he said. The American Cast Iron Pipe Co. has had considerable success in applying spectroscopic analysis to such studies.

As low as 0.01% lead in ordinary cast iron will lower the tensile strength 40 to 50%, Dr. MacKenzie brought out. Aluminum in only small percentages will cause porosity in ordinary cast iron. Lead and zinc in high-alloy cast iron are especially undesirable. The so-called "tramp" elements are giving increasing difficulties in foundries because, by virtue of special advantages these elements possess in other phases of steelmaking, they are becoming increasingly prevalent in the foundry scrap, Dr. MacKenzie concluded.

This, the fourth intersectional meeting in the Southeast, and the second at Chattanooga, was supported by a large attendance from out-of-town chapters. A luncheon meeting and several plant visits preceded the main meeting. Plants inspected were Wheland Co., Combustion Engineering-Superheater, Inc., Southern Electrical Corp., and Davenport Hosiery Mills.

Georgia Arranges Timely Program for 51-52 Season

Reported by Richard L. Priess
Southern Power & Industry

Now that the metalworking industry of the Southeast must be geared up to top capacity, the Georgia Chapter A.S.M. has scheduled a series of 1951-52 programs especially designed to help metalworking personnel do a better and more economical job.

"The Science of Designing Alloys" was discussed by R. H. Harrington, General Electric Knolls Laboratory, at the October meeting. "Fabrication of Light Metals" by E. A. Williams, Lockheed Aircraft Corp., Georgia Division, will be featured at the November meeting.

Subsequent programs include "Nickel and Nickel Alloys" by W. A. Mudge of International Nickel; "Nodular Iron" by C. K. Donoho, American Cast Iron Pipe Co.; "Fabricating Iron and Steel Sheets" by R. S. Burns of Armco; "Metallurgical Implications of Atomic Energy" by E. E. Thum of *Metal Progress;* and "Electric Furnace Steel Practice" by D. J. Girardi of Timken Steel and Tube Division.

The program was designed by Prof. Robert J. Raudebaugh of Georgia Institute of Technology.

Junior Members Placement Service In February Issue

The Junior Members' Placement Service, instituted by the A.S.M. Board of Trustees a year ago as a service to graduating students in metallurgy who are members of the American Society for Metals, has been established as an annual feature, and will be carried this year in the February 1952 issue of *Metals Review.*

This issue will publicize the qualifications of all graduating seniors and candidates for advanced degrees who will be available to industry between now and next June. It supplements the regular Employment Service Bureau, which is also open to junior members as well as regular members of the Society.

In accordance with this plan, all graduating students who are members of the American Society for Metals are invited to submit a resume of their qualifications, together with a photograph, which will be published, at no cost to the student, in the February issue of *Metals Review.* The names of the graduates will be listed under the name of the school they are attending, and replies can be sent either direct to the student or to the head of the department at the school or college.

In addition to bringing these candidates to the attention of the 22,000 members of the A.S.M. in this manner, a reprint of this section will be mailed to the personnel departments of large industrial metalworking plants.

Value of this service to students and employers alike was proven by the many letters of commendation and approval received at A.S.M. headquarters, along the lines of the following quotation:

". . . . I had hoped that upon my graduation from Case I should be able to obtain employment in the West, and thanks to A.S.M., I am located not only in the West, but in my home state. I am very grateful for the great service the Society has done me, and I feel that it deserves a lot of credit for taking such an interest in the placement of its junior members."

Special forms are available for listing the information to be published in *Metals Review.* They may be secured by addressing an inquiry to the Junior Members' Placement Service, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. The completed forms must be returned not later than Jan. 1, 1951.

AWARD WINNERS IN SIXTH ANNUAL A.S.M. METALLOGRAPHIC EXHIBIT

National Metal Exposition, Detroit, Oct. 15-19, 1951

Best in Show
Grand Prize of $100
H. P. Roth
Massachusetts Institute of Technology
Cambridge, Mass.
"Zirconium Viewed Under Polarized Light"
(in color)

Stainless and Heat Resisting Steels

Best in Class: A. E. Nehrenberg and F. Baureis, Crucible Steel Co. of America, Research Laboratory, Harrison, N. J.
"Gamut of Structures in 12% Cr, 12% W Hot Work Steel"

Honorable Mention: John J. Gilman, Crucible Steel Co. of America, Research Laboratory, Harrison, N. J.
"Discrimination of Carbides and the Sigma Phase in a Cast Steel."

Toolsteels and Tool Alloys

Honorable Mention: M. Hatherly, Defence Research Laboratories, Alexandria, N.S.W., Australia.
"Four Views of Alumina Inclusions in Heat Treated Carbon Steel for Deep Drilling."

Heavy Nonferrous Metals

Best in Class: H. P. Roth (See "Best in Show").

Honorable Mention: Anne R. Kendra, Cadillac Tank Plant, Cleveland, and J. W. Weeton, Lewis Flight Propulsion Laboratory, National Advisory Committee for Aeronautics, Cleveland.
"Microstructures of Haynes Stellite 21."

Light Metals and Alloys

Best in Class: C. J. Osborn, Aeronautical Research Laboratories, Department of Supply and Development, Commonwealth of Australia.
"Eutectics in Four Magnesium Binary Systems."

Surface Phenomena

Best in Class: Francis Cain, Jr., Atomic Power Division, Westinghouse Electric Corp., Pittsburgh.
"Transformation Markings in Zirconium."

Honorable Mention: T. H. Orem, National Bureau of Standards, Washington, D. C.
"Etch Pits in Monocrystalline Aluminum."

Honorable Mention: D. Glan Thomas, Swansea, Great Britain.
"Iron-Zinc Alloys on Surface of Galvanized Sheet."

Transitions or Changes During Processing

Best in Class: Mark A. Golik, Mellon Institute of Industrial Research, Pittsburgh.
"Reduction of Scale to Iron During Box Annealing of Hot Rolled Sheet Steel."

Honorable Mention: Roger A. Long and John P. Wisner, National Advisory Committee for Aeronautics, Cleveland.
"Structural Changes in 1035 at 1650° F. in Vacuo." (photographed at temperature)

Honorable Mention: M. J. Olney, University of Cambridge, Cambridge, England.
"Formation of Graphite at Surface of 1.2% C Steel, Heated in Vacuo to Various Temperatures."

Unconventional Techniques

Best in Class: W. L. Grube and S. R. Rouze, Physics Instrumentation Department, General Motors Research Laboratories, Detroit.
"Series of Four Electron Micrographs of Transformation Products in Eutectoid Steel."

Honorable Mention: John F. Radavich, Physics Department, Purdue University, Lafayette, Ind.
"Series of Electron Micrographs Showing Oxidation of Same Spot of Type 303 Stainless Steel in Air at 700° C."

Honorable Mention: F. Gordon Foster, Bell Telephone Laboratories, Murray Hill, N. J.
"New Technique for Observation of Magnetic Domains in a Single Crystal of Cobalt."

Honorable Mention: R. C. Gifkins, Baillieu Laboratory, Melbourne, Australia.
"Twin Bands in High-Purity Zinc, Cold Worked 3% as Shown by Multiple-Beam Interferometry."

Miscellaneous

Best in Class: Lawrence Himmel, Department of Metallurgical Engineering, Carnegie Institute of Technology, Pittsburgh.
"Eutectoid Decomposition of Wustite."

Student Division

Best in Class: Joseph C. Danko, Department of Metallurgical Engineering, Carnegie Institute of Technology, Pittsburgh.
"Martensite Substructure."

Lehigh Valley Chapter Starts 51-52 Season With Tour of Bethlehem Steel

Reported by W. N. Rice
Bethlehem Steel Co.

Approximately 190 members of the Lehigh Valley Chapter started the technical program of the 1951-52 season with a visit through the Bethlehem Plant of Bethlehem Steel Co. on Friday evening, Oct. 5.

The trip started in the Eugene G. Grace Auditorium where the group was welcomed by R. S. Lukens, assistant to the general manager of the Bethlehem Plant. A motion picture entitled "Fifteen Minutes with Bethlehem Steel" summarized the various activities of the Bethlehem organization and showed the variety of problems encountered in an integrated steel plant.

The group witnessed some of the basic steelmaking operations including the charging and tapping of a basic openhearth furnace, rolling of structural shapes, press and hammer forging. A tour through one of the large machine shops provided an opportunity to examine some heavy machinery in various stages of construction.

Visiting the main laboratory, the group looked over the facilities for experimental heat treatment, spectrographic analysis, creep and stress-rupture tests and the usual physical testing and metallographic laboratory equipment.

After completing the inspection trip, the entire group participated in an informal discussion while partaking of some refreshments.

Recounts Stories Behind Manhattan Project

Reported by A. D. Carvin
Joslyn Mfg. & Supply Co.

Fort Wayne Chapter A.S.M. opened its 1951-52 season with an address by Norman Hilberry, deputy director of Argonne National Laboratories, Chicago, an atomic energy research laboratory. Dr. Hilberry spoke at the regular monthly dinner meeting on Sept. 10.

The speaker is one of the organizers of the Manhattan Project, and is recognized for his research work on atomic physics. He concentrated his attention on the human interest experiences that had occurred during the atomic energy development of the Manhattan Project.

Demonstrations With Glass Show Effects Of Surface Stressing

Reported by A. R. Kunkle
York Corp.

Three facts influence the failure of a structural material under repeated stressing, J. O. Almen of General Motors Research Laboratories told the York A.S.M. members on Sept. 12. The subject of his talk was "The Effect of Residual Stresses on the Fatigue Strength of Structural Materials".

These three facts are as follows:

1. The surface material is weaker than the interior material.
2. Fatigue fractures result only from tensile stresses; therefore surface residual stresses in the material may make it weaker or stronger depending upon whether they are tensile or compressive.
3. The yield strength under repeated stressing is lower than the yield strength measured in a static tensile test.

A large part of the talk pertained to a demonstration of how the production of compressive residual stresses in the surface of a material, that will have to ultimately resist applied tensile stresses, may increase the breaking strength. This was demonstrated with a hollow glass droplet and with plate glass.

When the glass droplet was made it was cooled rapidly on the outside surface. This produced compressive stresses so great that the droplet was able to hammer a nail into a wooden board without breaking. However, when a small stone pebble was dropped inside the droplet, the droplet broke into many pieces. The inside surface had high residual tensile stresses.

An annealed glass plate ¼-inch thick that had been cooled slowly during manufacture broke with only a small pressure of a man's foot when supported at the ends and loaded in the center. The plate had very little residual stress. Its breaking stress was approximately 7000 psi.

Another glass plate had been rapidly cooled on the side when manufactured. Its dimensions were the same as the annealed glass plate and it also was supported near the ends. It was able to support the speaker's weight when slowly applied to the center of the plate. However, it broke into many small pieces when he jumped on it.

By test this "quenched glass plate" had a static breaking strength of 32,000 psi. where the "annealed" plate had only 7000 psi. The difference in the strength of these two materials was attributed to residual compressive stresses in the quenched plate.

Residual compressive stresses may be produced in steel by carburizing, nitriding, and quenching from tempering temperatures above 900°F. Cold-working of the surface by shot peening or rolling also produces compressive stresses. The harder the steel is initially, the greater will be the residual compressive stresses produced by cold work.

Grinding generally produces residual tensile stresses. However, if the last 0.002 in. is removed with a soft grinding wheel by making cuts only 0.0001 in., the residual stress will be practically zero. This procedure is used in determining the distribution of residual stresses.

Milwaukee Chapter Entertains Conferees

At a Special Meeting in Milwaukee Are: G. B. Kiner, Chairman of the Milwaukee Chapter A. S. M.; Rasmus Figenschou of Bergen, Norway, Secretary of W. M. C. Study Tour Group 5; Charles Keel, Basel, Switzerland, Chairman of Group 5; and John Beyerstedt, Vice-Chairman of the Chapter

Reported by Donald R. Mathews
Allen-Bradley Co.

Milwaukee Chapter A.S.M. was host to Study Tour Group 5 of the conferees to the World Metallurgical Conference on Oct. 4, at a dinner at the Milwaukee Athletic Club.

Study Group 5 was composed of 23 metal experts from 10 countries, whose prime interest was "welding and joining". The dinner and the evening discussions served as pleasant relaxation to the conferees between trips to the local plants of the A. O. Smith Corp. and the Harnischfeger Corp. where operations were observed.

The 26 entertaining A.S.M. members were primarily past chairmen, members of the Executive Committee, or 25-year members. Also present was J. F. Harper, past national A.S.M. president.

The local members listened intently to the comments of the conferees regarding their observations in many factories throughout the United States.

Of particular interest were the remarks by Rasmus Figenschou of Bergen, Norway, who compared the quality of welding in Europe with that in the United States. After saying that the group had seen " . . . many lousy welds in the United States . . .", Mr. Figenschou proceeded to illustrate that much was being learned by his group in this country, but, that we also can learn much from the practice of welding in other countries. There can well be a free exchange of industrial help and ideas that will benefit everybody concerned.

Columbia Initiates Research On Hardening Techniques

Columbia University has initiated a long-range program of research in the techniques for hardening steel aimed at utilizing low-alloy steels, and thus conserving critical alloying elements.

The first step of the program, which will cost about $35,000 and require about three years, is headed by Victor Paschkis, technical director of the heat and mass flow analyzer laboratory in the department of mechanical engineering. The project is designed to study thermal problems in quenching, making use of the heat and mass flow analyzer, a complex electric computer developed by Dr. Paschkis to solve heat flow problems.

The list of sponsoring firms includes: Ajax Electric Co., Philadelphia; Bell and Gossett Co., Morton Grove, Ill.; Caterpillar Tractor Co., Peoria, Ill.; E. I. Du Pont de Nemours and Co., Wilmington, Del.; Ford Motor Co., Detroit; Gulf Research and Development Co., Pittsburgh; Holcroft Corp., Detroit; Hughes Tool Co., Houston, Tex.; Reed Roller Bit Co., Houston; W. S. Rockwell Co., Fairfield, Conn.; Surface Combustion Corp., Toledo, Ohio; SKF Industries, Inc., Philadelphia; Timken Roller Bearing Co., Canton, Ohio; White Motor Co., Cleveland; and the Engineering Foundation, New York City.

Titanium Prospects Explored

At Kansas City Chapter's First Meeting of the Season Are James G. Cametti of Westinghouse Aviation Gas Turbine Division, Vice-Chairman; Max Hansen and Wm. E. Mahin of Armour Research Foundation, Speakers; and K. E. Rose of University of Kansas, Chairman (Photo by C. P. Kenyon)

Reported by K. E. Rose
University of Kansas

Past, present and future aspects of titanium were explored by two speakers before the Kansas City Chapter A.S.M., beginning its 1951-52 season on Sept. 19. The speakers were W. E. Mahin, director of research, and Max Hansen, chairman of the metals research department of Armour Research Foundation.

Although titanium is one of the more abundant elements, it can be refined only by complex and—to date—comparatively expensive methods, Dr. Mahin pointed out. Calculations based on the estimated potential consumption of titanium alloys show that any significant reduction in cost will result in a saving of many millions of dollars per year. This possibility, plus the many desirable properties of titanium alloys, makes research in this field especially attractive.

Dr. Hansen outlined the constitution, structure and transformation kinetics of titanium alloys. The crystal structure, atomic diameter, and position in the periodic table indicate that there is almost no limit to the number of alloys possible. Most of the common metals are within the ±15% range of atomic diameter for solid solubility, and interstitial-type solid solutions exist with hydrogen, oxygen, nitrogen, and carbon. The most useful binary alloys with titanium can be classified in three types of phase diagrams, resembling (*a*) Ti-Cr, (*b*) Ti-Mo, or (*c*) Ti-Al.

The structure of commercial titanium alloys is a mixture of two phases. Some authorities claim that the best results are obtained by proper alloying and correct hot working practice to bring about the optimum degree of intermingling of the phases in the duplex structure, but Dr. Hansen does not believe the possibilities of heat treatment should be overlooked. Titanium undergoes a polymorphic transformation similar to that in iron. A martensite-like reaction occurs when certain titanium alloys (beta Ti-Mo) are quenched, but the hardening effect is less than that from carbon in steel. Precipitation hardening is a feature in certain titanium alloys.

Time - temperature - transformation curves have been developed to show the transformation kinetics of titanium alloys. No particular difficulty is encountered in studying the beta-to-normal-alpha transformation, but special techniques are required to determine the Ms and Mf equivalents which relate to the formation of an acicular alpha phase.

Chapter-wide interest in the subject was shown by the lengthy question and answer period that followed the main talks.

Points Out Limitations Of End-Quench Test

Reported by A. F. Mohri
Chief Metallurgist
Steel Co. of Canada, Limited

The limitations of the end-quench hardenability test were discussed by John W. Sands of the development and research division of International Nickel Co., Ltd. in an address to the Ontario Chapter A.S.M. Sept. 7.

Mr. Sands' talk was confined mainly to steels which showed equivalent characteristics in the standard end-quench hardenability test, but subsequently developed quite different mechanical properties when quenched under identical conditions and sizes and tempered to equivalent hardness levels. From the results, it would appear that the discrepancies are of such magnitude that efforts to correlate end-quench curves with various quench sections of the same or different steels may result in material variations in properties and, therefore, in service performance.

Toolsteels Classified By Type Facilitate Stock Procurement

Reported by L. F. Franz
Boeing Airplane Co.

Toolsteels used at Boeing Airplane Co. are grouped into classes according to types, largely based on the A.S.M. classification. The steels in any one class, according to Harry P. Evans, Boeing metallurgist, have the same or similar composition so that identical heat treating methods will yield similar properties, regardless of the trade name of the steel. This classification allows greater freedom in procurement of stock and also greater economy than if the steels were classified by trade name.

Dr. Evans addressed the October meeting of the Puget Sound Chapter on "Heat Treatment and Usage of Toolsteels". As illustrations he showed slides of typical compositions of the several classes of steels, graphs of torsional impact toughness versus drawing temperature, and other properties.

The possibility of obtaining a tool with high surface hardness and high surface compressive stresses along with a tough core makes carbon toolsteel a first choice for many applications. Serious consideration should be given to these factors in choosing the proper steel for a given part, and it should be realized that a high-priced alloy steel or a deep hardening steel is not always the best steel for a given application.

It might be assumed that the toughness of a toolsteel would increase as the drawing temperature is increased, with consequent drop in hardness. This is not necessarily true. Class A toolsteel should be drawn at 350 to 400° F. for maximum toughness. Class D high-carbon high-chromium toolsteel should be drawn at either 400° F., with resulting hardness of about Rockwell C-60 to 63, or at 800° F. with resulting hardness of about Rockwell C-57 to 59. Draw tempertures between 450 and about 700° F. should not be used for toolsteels, and hardness values resulting from a draw in this range should not be specified.

The several classes of toolsteels will solve practically any tool problem that can arise. Each steel picks up the job where another lets off.

The speaker pointed out the usage of a well-known steel manufacturer's matched toolsteel diagram where Class A "water-hard" carbon toolsteel is the key to all toolsteels. Going in one direction from this, greater red hardness is obtained, in the opposite direction greater hardening accuracy and safety, in still another direction greater toughness, and in its opposite direction greater wear resistance.

Traces Growth of Western Steel

Walther Mathesius, President of the Geneva Steel Co. and Speaker of the Evening, Is Flanked at His Right by Wm. F. Nash, Jr., Chairman of the Los Angeles Chapter A. S. M., and at His Left by James A. Kavenaugh, Chairman of the Southern California Section of the Metals Branch of the A. I. M. E. Dr. Mathesius spoke on "The Growth of Western Steel"

No signs of a let-up can be detected in the magnificent industrial growth of the West, Walther Mathesius, president of Geneva Steel Co., told a group of Californians meeting in Los Angeles on Sept. 24. Dr. Mathesius addressed a joint meeting of the Los Angeles Chapter A.S.M. and the Southern California Section of the Metals Branch of A.I.M.E. on "The Growth of Western Steel".

"The western steel industry, although not able at present to satisfy the market's seemingly insatiable appetite, has done a creditable job, and the record proves it," the speaker declared, and proceeded to cite statistics in support of his contention.

The annual steel-producing capacity of the 11 western states reached approximately 5,200,000 net tons of ingots at the end of World War II—an increase of 150% over 1940. By the end of 1952, this steel capacity will have been increased to over 6 million net tons. At the same time, he pointed out, population in seven western states has increased 43% during the 1940-1950 decade, as compared to 14% for the U. S. as a whole. In 1940, 26% of the finished steel products consumed in these states was produced in the West; for 1950 the figure is 61%.

The earliest steel production on the Pacific Coast was at the Pacific Rolling Mill Co. in 1884, with one 5-ton and one 18-ton acid openhearth furnace. Dr. Mathesius traced the history of other early companies, culminating in the three present major producers—namely, Bethlehem Steel Co., which acquired Pacific Coast Steel Co. in 1929; United States Steel Co., which purchased Columbia Steel Corp.'s properties at approximately the same time; and the Kaiser Co., which started production at Fontana in 1943.

"Another distinguished phase in the history of the western iron and steel industry belongs to Utah," the speaker continued, "for it was here that the first pig iron was made west of the Missouri River." The steel industry of this state grew into impressive proportions with the construction of the Geneva Steel Co. in 1943.

Geneva Steel Co. is the largest steel plant in the western states, Dr. Mathesius pointed out, with a rated annual capacity of 1,150,000 net tons of pig iron and 1,283,400 net tons of steel ingots. It was built to produce ship plates and structural shapes for West Coast shipyards and other vital war plants from raw materials mined and quarried in Utah. A substantial program of expansion has been under way at Geneva for the past three years to increase its service to steel consumers in the West, and Dr. Mathesius then described the new facilities that are being installed.

Brief mention was also made of the birth and growth of western steel's companion development at Fontana, Calif., now owned and operated by Kaiser Steel Corp.

"Together with our fellow members of the western steel industry," Dr. Mathesius concluded, "we of Geneva Steel share in the faith that, when the shadows of war finally roll away, western steel production will continue to play an important part in furthering a soundly balanced economy and a steadily rising standard of living here in the growing West."

Opens New Steel Warehouse

Chicago Steel Service Co. officially opened its new general offices and warehouse at an "open house" on Oct. 18. Located on Kildare Ave. at 45th St., Chicago, the one-story steel frame structure covers 120,000 sq. ft. and was constructed at a cost of $1,500,000.

The company has installed the latest type equipment for materials handling and the processing of orders for special shapes and sizes of both stainless and carbon steels. The company warehouses and distributes steel products in seven midwestern states.

State College and A.S.M. Promote Industrialization Of Inland Empire Region

Reported by F. R. Morral
Head, X-Ray Diffraction
Division of Metallurgical Research
Kaiser Aluminum & Chemical Corp.

"Mold the future to our needs" was the keynote of the talk by Glenn Jones, director of the Community College Service at the State College of Washington. Addressing the Inland Empire Chapter on Sept. 25, Mr. Jones commented on the happy partnership between the College and the A.S.M. which actually started more than ten years ago.

He also reminisced of earlier days when the late Dean Arthur E. Drucker visualized this area as a light metals center. At that time a training program was inaugurated to staff the laboratories of the aluminum reduction and rolling mills established during World War II. Interest in the program expressed vividly the thirst for knowledge of metals shown in this community. Since that time the region has been growing from a trading, agricultural and extractive economy (lumber and mining) to an industrial center.

Interest in metals is again in evidence in the registration of the metallurgical classes just started. Mr. Jones explained the policies and aims of the College, and the relationship between the community and the College. He foresees a bright future both for the A.S.M. and the college extension courses in engineering for this area.

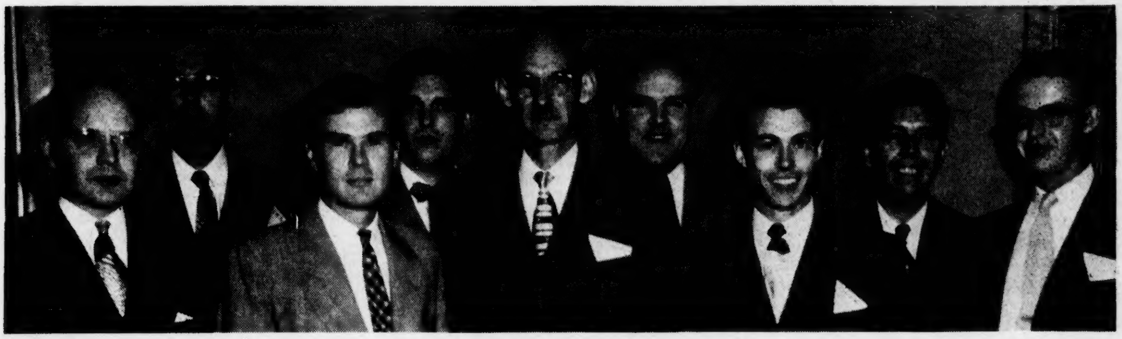
Servet A. Duran, professor of physical metallurgy, Washington State College, then explained the courses which are offered this fall. One is of a practical nature on heat treatment as applied to welding, machining and foundry; the other gives college credit on physical metallurgy.

Two sound films—Dr. Barnes' film made at Iowa State on "Motion Study Principles" and one on X-ray inspection—completed the opening meeting of the Inland Empire Chapter.

Openhearth Subsidiary Formed

A subsidiary company has been formed by John Mohr & Sons, Chicago, to engage in all phases of openhearth engineering and construction, according to Albert Mohr, Jr., president. The new subsidiary will be known as the Mohr Open Hearth Division, Inc. Licensing arrangements have been made with Maerz Industrie-Ofenbau A. G. of Zurich, Switzerland to offer the patented Maerz designs for openhearth furnaces to the American steel industry.

New Columbia Basin Chapter Holds First Formal Meeting



Officers of the New Columbia Basin Chapter Are as Follows: O. J. Wick, Vice-Chairman; J. M. Fox, Jr., Executive Committee (Reception and Attendance); G. L. Flint, Chairman; B. R. Elder, Secretary; Dr. Smith, the Speaker; R. Ward, Executive Committee (Program); R. G. Wheeler, (Membership); L. D. Turner, (Entertainment); and J. V. McMaster, (Publicity). R. S. Dalrymple, Treasurer, is missing from the picture

Electrochemical Principles Can Explain All Aqueous Corrosion, Hoxeng Shows

Reported by A. E. Leach
Metallurgical Engineer
Bell Aircraft Corp.

The misconception that a distinction exists between chemical and electrochemical corrosion was exploded in a talk before the Sept. 13th joint meeting of the Buffalo Chapter A.S.M. and the Western New York Section of the National Association of Corrosion Engineers.

R. B. Hoxeng of the United States Steel Research and Development Laboratory, in his lecture entitled "Fundamentals of Corrosion", pointed out that both electrons and metallic ions must be removed from metal in order for it to be corroded and that all aqueous corrosion can be explained in terms of electrochemical principles. Engineers who are not corrosion specialists were urged to view their problems in the light of these principles in order to make an accurate diagnosis of corrosion mechanisms.

The corrosion rate of a galvanic cell is not governed by electrochemical reaction potentials but rather it is controlled by reaction overvoltages because these determine the ease with which electrons or ions can be removed. Several other important factors in electrochemical corrosion were discussed and it was demonstrated that their effects are interrelated. For instance, facts about anode and cathode areas and anodic and cathodic polarization were treated separately. Then it was shown that control over the "corrosion current" could be exercised by the effects of anode area on anodic polarization and of cathode area on cathodic polarization. Acidic corrosion can be explained on the basis of migrating anode and cathode areas.

The subject of inhibitors was also covered. Some electrolyte additions retard corrosion by their effect on cathodic polarization, reducing the ease with which electrons are removed. Some common organic pickling inhibitors act in this way.

Mr. Hoxeng closed his lecture with an electrochemical interpretation of the passivation of stainless steel.

Reported by J. V. McMaster
Metallurgist, General Electric Co.

The new Columbia Basin Chapter of the American Society for Metals held its first formal meeting at the Desert Inn Hotel in Richland, Wash., on Sept. 26. This meeting marked the culmination of a summer's organizational activities.

Although the formal presentation of the chapter charter by one of the national officers will not occur until 1952, the membership as of Sept. 26 is regarded as the charter membership for the Columbia Basin Chapter. This date also represents the beginning of an opportunity for active participation in chapter activities by many members who have hitherto lived too far from their local organizations to enjoy that privilege.

This dinner meeting was made further noteworthy by the presence of Dana W. Smith, associate director of the division of metallurgical research for the Kaiser Aluminum and Chemical Corp., of Spokane, who addressed the gathering on "The Work Hardening and Annealing of Aluminum Alloys". Dr. Smith's previous association with the Aluminum Co. of America and the Glenn L. Martin Co., together with his present occupation, made him well qualified to discuss aluminum and to answer the questions in the lively discussion period that followed his address.

Announcement of the election of officers and Executive Committee (previously chosen as tentative) was made, as shown in the photograph at the top of the page.

Fitterer Appointed Dean Of Engineering at Pitt

G. R. Fitterer has been appointed as dean of the schools of engineering and mines at the University of Pittsburgh. Dr. Fitterer has been professor and head of the department of metallurgical engineering since 1939.

G. R. Fitterer

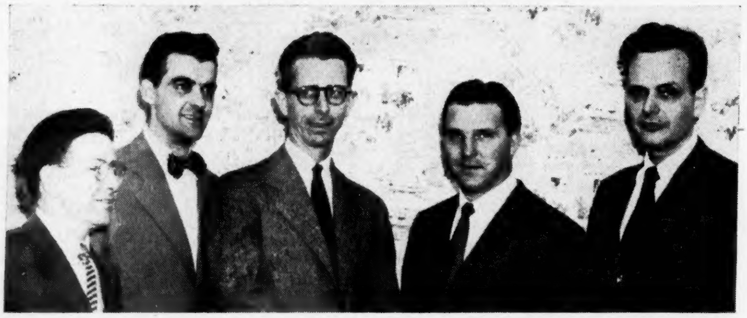
He received his Ph.D. degree from University of Pittsburgh in 1931, after graduating from Rose Polytechnic Institute and receiving his Master's from Carnegie Tech. During this period he was a fellowship student with the metallurgical advisory board of the physical chemistry and steelmaking program at the U. S. Bureau of Mines.

In the field of research he is known chiefly for the development of an electrolytic method for determining amounts and kinds of impurities in steel, the discovery of manganese-silicon alloys, and the development of the Fitterer pyrometer. He presented the annual Campbell Memorial Lecture before the A.S.M. in 1944.

J & L Adds 11 Openhearths

New steelmaking facilities which will increase output of ingot steel by 2 million tons were opened by Jones & Laughlin Steel Corp. in Pittsburgh on Oct. 30. Charles E. Wilson, director of the Office of Defense Mobilization, officiated at tapping ceremonies for the first of 11 new openhearth furnaces at the Pittsburgh Works. This is one of many projects undertaken by J & L in a $400,000,000, five-year expansion and modernization program to increase the corporation's steel production by 32%.

"Cinderella's Shoe Is Oversize"



So Said D. I. Brown (Second From Right), Technical Editor of Iron Age, *Speaking on Titanium Before the Mahoning Valley Chapter A.S.M. From left are Jim Phillips, chief metallurgist, Cold Metal Products, who served as technical chairman; W. W. Taylor, Cleveland regional editor, and John B. Delaney, Pittsburgh regional editor for* Iron Age; *D. I. Brown, the speaker; and John Kolb, associate editor in New York for* Iron Age. *(Photograph by Henry Holberson, chapter chairman)*

Reported by Eugene M. Smith
Youngstown Sheet and Tube Co.

In the transition of the "Cinderella" metal, titanium, to its rightful place in our metal economy, unusual opportunities are available to research and development. D. I. Brown, technical editor of *The Iron Age,* opened the 1952 season of the Mahoning Valley Chapter on Oct. 9 by factually exploring the present status of titanium, its growth and potentialities.

Introduced commercially in 1949 to the metal industry with all publicity stops out and production on a gram basis, titanium is growing astronomically. Production in 1950 was 60 net tons; in 1951, approximately 500 tons; by the end of 1952, it is estimated to reach close to 4000 tons.

With increasing production, first enthusiasm has been tempered by realism. Increased output has not provided the expected lower production costs, yet. Hence it is necessary to explore new and improved methods of production, and it is imperative for further research to improve the competitive position pricewise. Titanium sheets today cost $40,000 a ton.

To support all industry on the scope contemplated, American ore sources will have to be supplemented by contributions from Canada and India, Mr. Brown predicted. The progress of Kennecott Copper-New Jersey Zinc in making titanium-rich slag at Sorel, Canada, is being followed with anticipation.

With the glamour of the debut passed, the research man's effort is directed to:

1. Assuring a cheap source of raw material.
2. Invention of a cheaper process for making sponge metal.
3. Development of less expensive melting methods including bypassing the sponge stage.
4. Discovery of suitable refractories to contain molten titanium.
5. Control of residual oxygen and nitrogen from titanium.
6. Study of alloy systems.
7. Seeking lubricants for cold drawing of titanium products.
8. Utilization of machining and scrap trimmings.
9. Development of techniques for carburizing or nitriding.
10. Discovery of a method for electrodeposition.

Contrary to common belief, titanium is not a heat resistant, high-temperature metal; nor is it available on the open market. Although the melting point is 3050° F., strength falls off rapidly above 700° F. To date, the largest ingot to be cast is reported to weigh 1500 lb.

Large Producers Listed

The Air Corps finds it desirable to pay up to $40 a pound to save one pound of weight. Hence, titanium finds ready acceptance in military aircraft. As a firewall and forged structural parts, it has found some applications. Titanium's light weight, plus corrosion resistance, suggests its use for steam turbine blades.

The largest producers of titanium at present are: Titanium Metals Corp., Rem-Cru Titanium, Inc., and Mallory Sharon Titanium Corp. The latter two companies obtain sponge metal from Du Pont. The Niles Rolling Mill, at Warren, Ohio, hot rolls the Mallory Sharon products.

With continued effort, titanium will eventually find its place among the metals as a unique material with valuable and worthwhile applications of its own. As contrasted with aluminum, which was originally abundant, but had few applications, titanium has many potential uses, but lacks, at the present, both availability and low price.

Dayton Has Lectures On Basic Principles Of Heat Treatment

Reported by Leland F. House
Research Laboratories
Armco Steel Corp.

"Principles of Heat Treatment" is the subject of a practical educational course in metallurgy being presented by the Dayton Chapter A.S.M. The fine response of the community to last year's educational series on "Modern Steels" obliged the Dayton Chapter to offer another educational program.

This series of lectures will attempt to tear away the veil of mystery surrounding the art of heat treating and explain why a piece of steel is hard after it is heat treated and then quenched. These lectures will enable those who have not made a formal study of metallurgy to become acquainted with the basic principles of heat treatment. The course is given in terms which the layman can comprehend, yet with such thoroughness that it is an interesting refresher course for the metallurgist.

The course is based on two texts: "Principles of Heat Treatment," by M. A. Grossmann, and "The Annealing of Steel", by Peter Payson. The Grossmann textbook is provided for each registrant at a cost of $3.50. This represents the entire cost of the course; there is no tuition fee, and the Payson textbook is supplied without charge.

The series of seven lectures is being given on Wednesday nights, Oct. 17 through Dec. 5. Chairman of the Educational Committee is Richard Moncrief, metallurgist for the Frigidaire Division, G.M.C., and the lecturers are as follows:

R. W. Edmonson, President, Metallurgist Service Inc.

L. L. Jaffe, Supervisor, Manufacturing Research Laboratory, Frigidaire Division, G.M.C.

J. J. Niehaus, Metallurgist, Wright Field.

R. R. Kennedy, Chief, Metallurgical Branch, Wright Field.

S. M. DePoy, Superintendent, Dayton Forging and Heat Treating Co.

G. A. Baker, Vice-President, Duriron Co., Inc.

S. R. Prance, Chief Metallurgist, Inland Manufacturing Division, G.M.C.

Copperweld Adds Subsidiary

Copperweld Steel Co., Glassport, Pa., has purchased all the outstanding stock of Flexo Wire Co., Inc., of Oswego, N. Y. Flexo has been a producer of small and fine sizes of Copperweld, copper and bronze wires and cables, with a capacity somewhat greater than one-half million pounds per month. Flexo Wire Co. is being operated as a wholly owned subsidiary of Copperweld.

Adolph Bregman, Consulting Editor for M.P., Dies Suddenly

Adolph Bregman, who was appointed a consulting editor of *Metal Progress* in January 1950, died suddenly of a heart attack on Oct. 5.


A. Bregman

Mr. Bregman was a graduate of the Colorado School of Mines. After several brief engagements in the smelting and refining industry (and with the U. S. Army), he became managing editor of *Metal Industry* in 1919, holding that position for 21 years. Since that time he has been a consulting engineer and executive secretary of the Masters' Electro-Plating Association, Inc.

As a consulting editor of *Metal Progress*, he was responsible for reporting newsworthy events and preparing special articles in the field of cleaning, plating and metal finishing.

John C. Huffman

John C. Huffman, 48, district manager of the Cleveland territory for the Braeburn Alloy Steel Corp., died suddenly on Sept. 30. Mr. Huffman served Braeburn for 27 years, first in the metallurgical department at the main office, and then as a salesman in Cleveland. In 1932 he was appointed assistant district sales manager, and in 1945 became district manager.

H. A. Knowlton

Harry A. Knowlton passed away on August 31 at Wesley Memorial Hospital in Chicago after a brief illness. He was a metallurgical engineer in the employ of the Wisconsin Steel Division of International Harvester Co.

Mr. Knowlton was born in Milwaukee on June 4, 1925. He received a B.S. degree in mechanical engineering from Illinois Institute of Technology and a B. S. in metallurgical engineering from Carnegie Institute of Technology.

Edward L. Zapp

Edward L. Zapp, chief metallurgist, Tube Reducing Corp., Wallington, N. J., since March 1943, died suddenly of a heart attack on Aug. 5.

Prior to joining Tube Reducing Corp., he had responsible positions with Henry Disston & Sons, Inc. and with Hyatt Roller Bearing Corp. For the latter firm he served as chief chemist and as chief metallurgist during the years 1917 to 1937.

He was active as a member of the New Jersey Chapter A.S.M. and was elected a member of the Executive Committee for the three-year period 1950 to 1952. He was also a member of the John F. Wyazlek Memorial Fund Committee, whose duty it is to judge all applications for educational help to young metallurgists.

Salt Bath Heat Treating Reviewed at St. Louis

Reported by Frank Rassieur
Assistant Manager, Paulo Products Co.

Various types of furnaces are suitable for salt bath heat treating, according to John Sheppard, speaking at the first fall meeting of the St. Louis Chapter A.S.M. Mr. Sheppard is technical representative of American Cyanamid Co.

The firing of these various furnace types was compared and the alloys used for fixtures, pots and electrodes discussed. Throughout his talk Mr. Sheppard was able to supplement his material by suggesting to his audience various practical ways in which they could more easily handle their salt bath operations and various ways in which they could solve the problems which commonly come up in salt bath heat treating. For example, while he was discussing salt bath furnaces, he diagrammed a simple method for handling the unpleasant job of emptying molten salt from deep furnaces.

After touching briefly on the subject of control equipment, Mr. Sheppard launched into the main portion of his talk which dealt with the various types of salts used. Neutral salts were dealt with first, and the salts operating in each temperature range were described. Each bath can become contaminated in different ways and Mr. Sheppard pointed out how such contamination can be avoided or corrected. Self-rectifying salts and salt rectification by chemical addition were discussed.

In describing liquid carburizing salts and their operation, Mr. Sheppard told something of the chemistry of calcium and barium catalysts used in these salts. Easy-washing liquid carburizing and the water soluble catalytic liquid carburizer can be used for shallow, medium and deep cases as required.

The final portion of the talk was devoted to a brief coverage of salt-bath brazing using copper or brass.

Conferees Visit Worcester

Carter C. Higgins (Left), President and General Manager of Worcester Pressed Steel Co., Is Presented With a Certificate of Appreciation by Robert Bonnevie, Director of the Belgian Ministry of Economic Affairs, and Chairman of W. M. C. Study Tour Group 3 on Ferrous Fabrication. The citation marked the inspection tour of the plant made by the overseas conferees in September

Tells How Materials for Chemical Manufacturing Industry Are Selected

Reported by S. C. Hayes
Supt., Heat Treating & Pickling Dept. Armco Steel Corp., Rustless Div.

Several factors are involved in selection of engineering materials in the chemical manufacturing industry, Ward R. Myers of E. I. Du Pont de Nemours and Co. told the Baltimore Chapter A.S.M. on Sept. 17. These factors are performance, availability, "fabricability" and cost.

Dr. Myers expanded particularly upon performance, citing a number of examples in which materials in service failed to respond as predicted from laboratory tests, and giving the reasons therefor (as ascertained after failure, of course!). Testing of materials in a semi-works unit was highly recommended to develop data on performance rather than laboratory methods. Conditions which might be overlooked, or considered as inconsequential departures from laboratory conditions, may become astonishingly significant in service.

In the question period that followed the talk, conducted by Technical Chairman J. K. Rummel of the Sheppard T. Powell Co., much interest was evidenced in welding of stainless steels, in the substitution of A.I.S.I. Types 304-ELC and 316-ELC for Types 321 and 347 stainless steels, in stress-corrosion cracking, and in the possibilities of nonmetallic materials, especially plastics, as alternates for metals in corrosive service.

The coffee speaker was Rip Collins, ex big-leaguer, who provided some excellent baseball anecdotes.

Stresses Urgency of Alloy Substitution

Russell Franks (Second From Left) of Electro Metallurgical Division Was Principal Speaker for the Calumet Chapter in October. In the photograph are Harold Neal of Gary Works, U. S. Steel Co., technical chairman; Mr. Franks; A. J. Scheid, Jr., of Columbia Tool Steel Co., chapter chairman; and J. R. Bateman of Standard Forgings Corp., vice-chairman

Reported by A. J. Cleveland
Manager, Special Steels Division
W. J. Holliday & Co., Inc.

The urgency of intelligent alloy substitutions by American steel producers for at least the duration of the existing critical international situation was stressed emphatically by the speaker at the Oct. 9th meeting of the Calumet Chapter, A.S.M.

Russell Franks, manager of development for the Electro Metallurgical Division of the Union Carbide and Carbon Corp., in his presentation, warned that it is the duty of the entire steel industry to cease complaining about the alloys we do not have in abundance and concentrate on those available to us in quantity.

The metals considered strategic are chromium, nickel, molybdenum, tungsten and cobalt, with titanium as a distinct possibility. While manganese is also in short supply, Mr. Franks did not include it in the foregoing group because it falls in a category by itself.

The advent of gas turbines and the rapidly accelerating demand for jet aircraft engines have brought about the strategic classification of nickel, tungsten, molybdenum and cobalt—the elements most effective in contributing to high-temperature strength and corrosion resistance. Chromium, the other critical metal, performs the important function of substantially increasing resistance to scaling at the high temperatures encountered in jet operation.

The gas turbine produces considerably more power than the steam turbine, internal combustion, or diesel engine, at the same time foregoing the advantages of coolants such as water or oil. Very little lubrication is possible in jet construction. The strategic metals are a must in the production of the gas turbine; there are no substitutes.

Since there are no new sources of critical materials, the only possible way to increase our supply to keep pace with the mounting aircraft requirements, is to reduce substantially the quantities used in all other steel manufacture. As Mr. Franks so pointedly stated, "If we cut our use of these elements by one-half in all other alloy steels, we immediately double our supply."

The steel producer has available as substitutes silicon, manganese, boron and vanadium. The possible successful combination of one or more of these elements with materially reduced amounts of the scarce alloying metals presents a challenge to all manufacturers of steel. It is apparently impossible to compute the correct compositions for substitute alloy steels from hardenability curves; the task requires the utmost ingenuity on the part of the steelmaker and borders on the trial and error method. Mr. Franks cautioned that erroneous calculations or indiscriminate experimentation could waste great quantities of vitally essential alloys.

York Hears Tarasov

Reported by A. R. Kunkle
York Corp.

York Chapter A.S.M., meeting on Oct. 10 in Waynesboro, Pa., was privileged to hear L. P. Tarasov of the Norton Co. speak on "Metallurgical Aids to Better Grinding".

Dr. Tarasov elaborated on three major considerations in grinding technique, namely, grindability, surface cracks, and grinding burn. Details of his talks have been reported in previous issues of *Metals Review.*

Dr. Tarasov also showed several slides of grinding problems.

New Building for Texas Firm

Dolan Industrial Sales, operated by Leland V. Dolan and J. D. Bailleres, has moved into a new building and warehouse with an area of 1950 sq. ft. at 5506 Lawndale Ave., Houston, Texas. The firm deals in cutting tools, machine shop equipment, hardness testers and furnaces.

Mr. Dolan has long been active in the affairs of Texas Chapter A.S.M. Last year he served as reporter for *Metals Review,* and this year is the chapter photographer.

W.M.C. Visitors at New York University

A. S. M. Past President Harold K. Work, Director of the Research Division, New York University College of Engineering, Looks on as Dean Thorndike Saville Accepts a Certificate of Appreciation From Arthur Winterbottom, Professor of Physical Metallurgy, Norway Institute of Technology. Professor Winterbottom was spokesman for a group of 30 World Metallurgical Congress visitors to the University

Puget Sound Chairman Honored

At the First 1951-52 Meeting of the Puget Sound Chapter Are Prof. J. A. Finley, the Speaker; E. T. Carlson, Newly Elected Chairman; and C. R. Jackson, Who holds the Certificate Presented to Him as Retiring Chairman

Reported by L. F. Franz
Boeing Airplane Co.

Speaking on "Forming of Nonferrous Metals" before the first meeting of the new season for the Puget Sound Chapter A.S.M., Prof. John A. Finley of University of Washington devoted his attention largely to aluminum, magnesium and titanium alloys. Mr. Finley is assistant professor of metallurgical engineering at the School of Mineral Engineering.

Two important factors involved in deep drawing, as well as other methods of forming nonferrous metals, are grain size and annealing. Neither coarse-grained nor dead soft material is desirable, since either may lead to undesirable local deformation. Fine-grained structures act as a barrier to plastic elongation and tend to minimize localized deformation.

The crystalline system in which metals solidify is another factor involved in forming operations. Metals are plastically deformed only along certain slip planes. Aluminum has a face-centered cubic structure, which confers good ductility. Aluminum can be modified by additions of copper to form precipitation hardening alloys. Copper is also face-centered cubic, but because of difference in the size of the aluminum and copper cubes, it tends to distort the crystal lattice. By adding metals that solidify in a different crystalline system (such as close-packed hexagonal) greater distortion of the crystal lattice is attained while basically retaining the face-centered cubic structure. This gives the alloy greater strength at a sacrifice of ductility and formability.

Magnesium solidifies in a close-packed hexagonal system. Only the basal planes in the hexagonal system are slip planes at room temperature. By heating magnesium alloys to 300 to 400° F. the face planes also become slip planes so that greater ductility and formability are attained. As with aluminum, any alloying additions that distort the symmetry of crystal lattice add to the strength of the resulting alloy.

Titanium also solidifies in the close-packed hexagonal system and is characterized by rapid work hardening, similar to magnesium.

Although titanium is the fourth most abundant metal, it has not been used to a great extent to date because of the difficulty and expense of producing it from its natural forms. It has a strong affinity for oxygen, nitrogen, and carbon, which have an embrittling effect. Additions of manganese and aluminum produce alloys with tensile strengths of 180,000 psi.

Generally speaking, in order for a light alloy to replace a heavier alloy, the ratio of the tensile strengths must be at least equal to the ratio of the specific gravities. For example, steel has a specific gravity of approximately 7.9 and titanium has a specific gravity of about 4.5. Therefore, in order for titanium to replace a steel with a tensile strength of 210,000 psi., the titanium must have a tensile strength of about 120,000 psi.

Talk on Titanium Offered By Armour Researcher

A talk on "Physical Metallurgy of Titanium and Its Alloys" is available for presentation before A.S.M. chapters by Max Hansen, assistant chairman of the metals research department of Armour Research Foundation. The talk covers the structure and physical properties of pure and commercial titanium, phase diagrams of alloy systems, mechanical properties of the alloys, and effect of heat treatment. Dr. Hansen, formerly professor and head of the metallurgical institute of the Technical University of Berlin, is the author of the handbook on "The Constitution of Binary Alloys".

Requests for presentation of the talk should be addressed to W. E. Mahin, director of research, Armour Research Foundation of Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

Compliments

To BENJAMIN F. SHEPHERD, chief metallurgist, Ingersoll-Rand Co., and a past president of the American Society for Metals, on the award of a Certificate of Appreciation for service with the Technical Industrial Intelligence Committee, Joint Chiefs of Staff, during World War II.

♦ ♦ ♦

To the TEXAS CHAPTER A.S.M., its officers and executive committee, on the part it is taking in the large and ever-growing metals industry in the Houston area, as exemplified by the fine write-up in the July 1951 issue of the *Houston Magazine*.

♦ ♦ ♦

To FREDERIC J. ROBBINS, president of Sierra Drawn Steel Corp., Los Angeles, a past chairman of the Los Angeles Chapter A.S.M. and a past national trustee, on his activities on a team of top management men who visited Scandinavian countries in August and September under the sponsorship of ECA and the National Management Council.

♦ ♦ ♦

To CARL WAGNER, visiting professor of metallurgy, Massachusetts Institute of Technology, on the award of the first Palladium Medal of the Electrochemical Society for outstanding contributions to corrosion and to fundamental electrochemistry.

♦ ♦ ♦

To INTERNATIONAL HARVESTER CO., on the election of three of its employees as A.S.M. chapter chairmen —namely, WALTER B. CHENEY, assistant works metallurgist, chairman of the Fort Wayne Chapter; BRUCE L. MCMILLAN, metallurgist, chairman of the Louisville Chapter; and G. B. KINER, representative on an International Harvester sustaining membership and chairman of the Milwaukee Chapter.

♦ ♦ ♦

To WILLIAM A. DERIDDER, chairman of the board of General Metals Corp., Los Angeles, on his election as president of the California Manufacturers' Association.

♦ ♦ ♦

To ZAY JEFFRIES, retired vice-president of General Electric Co. and director-general of the World Metallurgical Congress held in Detroit last month, on his election as an honorary member of the Japanese Institute of Metals. (See page 6.)

Temple Meeting Inaugurates Philadelphia Season; New Steel Plant Described

Reported by Charles W. Alexander
Metallurgist, Henry Disston & Sons, Inc.

The annual Temple Meeting of the Philadelphia Chapter A.S.M. was held at Temple University on Sept. 28. This meeting inaugurates the fall season of the chapter and the opening of the joint A.S.M-Temple Evening Certificate Course in Metallurgy.

The Temple Evening Course is starting its 31st consecutive year. Open to all persons interested in metallurgy, it offers a practical course in the manufacture, fabrication, use and inspection of metals. It is now under the able direction of Walter J. Kinderman.

The speaker of the evening was Albert J. Berdis, general superintendent, Fairless Works, United States Steel Co. His address was entitled "The Development of the Fairless Works at Morrisville."

Mr. Berdis showed a series of color slides illustrating the development of the plant from the original farm land to its present status. Now 20% completed, the Fairless Works is to be a completely integrated steel plant producing hot and cold rolled sheets, tin plate, billets, bars and pipe skelp from Venezuelan ores and Pennsylvania coal and limestone. The pipe

Claire C. Balke of the Philadelphia Chapter Greets Albert J. Berdis (Right), Speaker at the Annual Temple Meeting. Dr. Balke is chairman of the Educational Committee

skelp is to be fabricated into pipe in Morrisville by a division of the National Tube Co., which is also being erected at the site of the Fairless Works.

Mr. Berdis told of the enormous task of planning such a gigantic undertaking. A total of some 4000 man-years is being expended on engineering alone to erect the plant and prepare for operation. All of the mills are to be the most modern type with many recent developments and innovations in operating procedure.

Tells How Boron Replaces Scarce Alloying Elements

Reported by John J. Kenny, Jr.
Methods Engineer
American Seating Co.

Use of boron for treatment, especially hardening, of steel was discussed by H. K. Yeager, metallurgical engineer for United States Steel Co., guest speaker at the meeting of the West Michigan chapter, A. S. M. on Sept. 17.

H. K. Yeager

He pointed out that boron in some instances can replace chromium, nickel, manganese or molybdenum for alloying, and added:

"The alloy shortage is worse now than in World War II because we were forced to make extravagant use of highest grade ore and are now mining lower grade deposits; we are producing 30% more steel in the United States, and military, naval and aircraft equipment today requires richer alloys."

He stated research is in progress for widening application of boron steels to help meet alloy shortages.

Tocco's Osborn Visits Metalworking Southeast

Reported by Richard L. Priess
Southern Power & Industry

Harry B. Osborn, Ohio Crankshaft Co.'s induction heating ambassador, presented a thorough and timely discussion before the Georgia Chapter A.S.M. at the Oct. 1st dinner meeting. Personnel of the metalworking Southeast, now gearing up to top capacity, obtained many plant-tested ideas on how they can do a better and more economical job.

Dr. Osborn quickly reviewed the principles of induction heating and corrected several misunderstandings often encountered when plant men consider the use of high-frequency heating, particularly of nonmagnetic materials. Of particular interest was the newest plant-tested application of induction heating—the descaling of bar stock in lieu of pickling.

Unique Tocco installations in the Southeast received particular attention. International Harvester Co. in Louisville, with a total capacity of over 6000 kw. for forging and heat treating shops, is one of the biggest producers of high-frequency power for industrial use in the world. More than 6000 kw., ranging from 60 to 450,000 cycles, is used for heating billet and bar material to forging temperatures and heat treating gears, pinions, splines, cylindrical surfaces, and similar parts.

Increased production, greater die life, reduced material cost and improved working conditions have resulted in the forge shop. Other economies result from the use of carbon steels in place of alloy steels, and the elimination of many machine operations.

Steel Castings Welded for Repair, Composite and Cast-Weld Construction

Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Co.

Northwest Chapter A.S.M. held its regular monthly meeting jointly with the American Foundrymen's Society on Oct. 9, to hear T. R. Eggert, assistant to the technical and research director of the Steel Founders' Society of America, speak on "The Welding of Steel Castings".

The subject was considered from three aspects—namely (a) repair welding of steel castings, (b) fabrication of composite structures from steel castings and wrought materials, and (c) construction of cast-weld structures from two or more steel castings.

Metal-arc welding involves high localized temperatures which set up sharp temperature gradients between the weld metal and base metal. Rapid cooling of this weld zone may result in quench hardness, thermal stresses, hot cracks and cold cracks. The most effective step to minimize these undesirable effects is to slow down the heating and cooling rates of the weld zone. This is done by selecting suitable preheat and interpass temperatures and by post-weld heat treatments.

The speaker went on to say that steel castings are used in composite fabrication to simplify intricate and expensive wrought assemblies, to permit easier welding when the physical dimensions of a section of a structure do not lend themselves satisfactorily to the welding operation, to simplify the jig and fixture problem of fabrication and to supply special alloyed parts for structures. Composite fabrications can be made simpler and stronger by welding steel castings to wrought materials.

Cast-weld construction can lead to lower costs in the pattern room, core room and cleaning department. At the same time dimensional control and customer relations are improved and the foundry is put in a more competitive position.

"Get the Metal Hot And Hit It" Remains Forging Fundamental

Reported by Arne Nyen
Metallurgical Laboratory
Minneapolis-Moline Co.

While forgings and machines are getting bigger and heavier all the time, the fundamentals of forging remain the same. "Get the metal hot and hit it," said Victor Brown, director of research and metallurgy and assistant to the president, of the Kropp Forge Co., in an illustrated talk on "Fundamentals of Forging Practice". Mr. Brown addressed the Northwest Chapter A.S.M. at its regular monthly meeting on Sept. 20.

The shop must have complete knowledge of the customer's expectations as well as specifications, he continued. To satisfy today's customer, the shop must maintain a rigid inspection program from the mill stock to the finished product, including visual inspection at the forge, physical and chemical tests. The chemical tests are routine for mill checks as well as production control.

Step testing is also done from the rough stock deep enough into the finished product to satisfy the customer's specifications. Checking can consist of no test at all to 100% testing of all forgings. On some forgings quality control costs more than the labor and material.

A temperature head is used on most furnaces. In some shops they have gone to high head heat furnaces using high-temperature refractories. Time is the important control measure.

Scale formation is receiving more attention in the forge shop because of its importance to die life. While dies can be repaired by welding, it is strictly an emergency measure. The usual method of prolonging the life of a die block that is washing out or wearing is to take off a cut and resink the die. Another method is to use inserts of a high-alloy heat resisting material.

A die must be "broken in" correctly, the speaker asserted. Usually the first few hundred forgings determine the life of the die. Too much metal in the die will ruin the die as well as the forging. The flash is only to insure complete filling of the die cavity and then to carry off the small amount of metal that should be left. If checking in a die is not watched, it will become so bad that the die cannot be resunk.

A series of slides showed examples of Kropp work from the bar stock to the finished forgings. The slides showed different methods and different types of forge hammers.

Although the trend is to automatic pushbutton forging on small parts, there is still much work to be done in that field.

The whole talk was interspersed with questions and answers. There was also a question-and-answer period after the slides were shown.

IMPORTANT MEETINGS *for December*

Nov. 30-Dec. 1—American Electroplaters' Society, Detroit Branch. Annual Meeting and Banquet, Hotel Statler, Detroit. (W. L. Pinner, c/o Houdaille-Hershey Corp., 9210 Roselawn Ave., Detroit 4, Mich., or O. H. Tiedeman, 526 Catalpa Dr., Birmingham, Mich.)

Dec. 2-5 — American Institute of Chemical Engineers. Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (F. J. Van Antwerpen, A. I. Ch. E., 120 East 41st St., New York 17, N. Y.)

Dec. 6-8—Electric Furnace Steel Committee, American Institute of Mining and Metallurgical Engineers. Ninth Annual Conference on Electric Furnace Steel, Hotel William Penn, Pittsburgh. (Ernest Kirkendall, A.I.M.E., 29 West 39th St., New York 18, N. Y.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Boston	Dec. 7	Hotel Shelton	Robert S. Williams	A Metallurgist in Japan (Sauveur Memorial Lecture)
Buffalo	Dec. 13	Hotel Sheraton	Clarence Jackson	Fabrication of New Emergency Steels
Calumet	Dec. 11	Phil Smidt & Son, Whiting, Ind.	J. V. Beall	Potential Iron Resources
Canton-Massillon	Dec. 4	Mergus Restaurant	Cyril Wells	Conservation of Strategic Alloying Elements
Chicago	Dec. 10	Furniture Club		Annual Christmas Party
Cincinnati	Dec. 13	Engineering Society	John Chipman	National Officers' Night
Cleveland	Dec. 3	Tudor Arms Hotel	John Chipman	Education for the Metals Age
Columbus	Dec. 12	Battelle Memorial Institute	John Chipman	National Officers' Night
Dayton	Dec. 12	Engineers Club		National Officers' Night
Detroit	Dec. 10	Elmwood Casino		Christmas Party
Eastern New York	Dec.			Christmas Party
Indianapolis	Dec. 17	McClarney Restaurant	H. R. Nelson	Atomic Energy
Lehigh Valley	Nov. 30	Allentown, Pa.	Merrill A. Scheil	Steels for Elevated Temperature Service
Louisville	Dec. 5		Eldon C. Hurt	Hard Facing Materials
Mahoning Valley	Dec. 11	Post Room, V.F.W.	John Chipman	National Officers' Night
Milwaukee	Dec. 7	North Hills Country Club		Stag Party
Missouri School of Mines	Dec. 12			
Montreal	Dec. 3	Queen's Hotel	John M. Hodge	A Simplified Concept of Heat Treatment and Hardenability
Muncie	Dec. 11		J. T. Richards	Copper-Beryllium Alloys
New Haven	Dec. 14	Actors Colony Inn, Seymour, Conn.		Christmas Party
New Jersey	Dec. 10	Essex House, Newark		Annual Christmas Smoker
New York	Dec. 10	Schwartz Restaurant		Nondestructive Testing (Panel Discussion)
North West	Dec. 14	Minneapolis Athletic Club		Christmas Party
Notre Dame	Dec. 12		D. L. Mathias	Lime-Coated Ferritic Electrodes (Joint Meeting with A.W.S.)
Ontario	Dec. 7	Royal Connaught Hotel, Hamilton	John Convey	Current Metallurgical Problems of the Bureau of Mines
Ottawa Valley	Dec. 4	P.M.R. Labs.	Wm. S. Pellini	Solidification of Metals
Penn State	Dec. 11	M.I. Art Gallery State College	Jerome Strauss	Boron in Steels
Peoria	Dec. 10	American Legion Building, Morton, Ill.	Harry McQuaid	New Economics in Steelmaking and Processing
Philadelphia	Dec. 7	Penn-Sheraton Hotel		Winter Frolic
Pittsburgh	Dec. 7	Hotel Schenley		Christmas Party
Purdue	Dec. 11	Purdue Union	Bruce W. Gonser	Titanium
Rochester	Dec. 10	Howard Johnson's	L. E. Gippert	Toolsteels
Rocky Mt. Pueblo	Dec. 20			Local Talent
Rocky Mt. Denver	Dec. 21			Local Talent
Rome	Dec. 3	Hotel Utica	J. W. Freeman	High-Temperature Alloys
St. Louis	Dec. 7	Melbourne Hotel		Christmas Party and Dinner Dance
Syracuse	Dec. 4	Onondaga Hotel	C. D. Moriarity	Nondestructive Testing
Terre Haute	Dec. 3	Indiana State Teachers College Student Union		Welding
Texas	Dec. 4	Ben Milam Hotel, Houston	J. J. Heger	Processing, Fabrication and Selection of Stainless Steels
Toledo	Dec. 15	Maumee River Yacht Club		Christmas Party
Tri City	Dec. 4	Arsenal Cafeteria	K. J. Bigelow	Jet Propulsion
Utah	Dec. 18	Salt Lake City		Christmas Party
Washington	Dec. 10		A. Muller	Metallurgical Aspects of Aircomatic Welding Process
Worcester	Dec. 12	Hickory House	S. S. Kistler	Wear Resistant Materials
			Malcoln Maynes	Tumbling Abrasives
			W. F. Winemiller	High-Temperature Refractories
			J. L. Swensson	Abrasive Belts
York	Dec. 12	Lancaster, Pa.	P. R. Wray	Boron Steels

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

A GENERAL METALLURGICAL

240-A. Blast Furnace Slags as Agricultural Liming Materials. O. R. Carter, B. L. Collier, and F. L. Davis. *Agronomy Journal,* v. 43, Sept. 1951, p. 430-433.

How blast-furnace slag is of value as an agricultural liming material. In most cases, slag is as efficient in crop production as limestone when applied on an equivalent basis. Slag contains small amounts of boron and other essential minor elements. 17 ref. (A8, D1)

241-A. Review of Iron and Steel Literature for 1950. Part III. Morris Schrero. *Blast Furnace and Steel Plant,* v. 39, Sept. 1951, p. 1101-1105.

Literature pertaining to corrosion, cleaning, protective coating, and foundry is listed. Also U. S. Government publications relating to the iron and steel industry. (A10, Fe, ST)

242-A. What Can U. S. Do About Copper? *Business Week,* Sept. 29, 1951, p. 100-102, 104.

Problems of Cu supply in the U. S. Shows graphically that domestic output is not rising and that imports are falling. (A4, Cu)

243-A. Statistical Review of Canada's Mining Industry, 1950. H. McLeod. *Canadian Mining and Metallurgical Bulletin,* v. 44, Sept. 1951, p. 621-627; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 399-405.

Reviews Canada's mining and industry for 1950 under the following topics: industrial production and national income, mineral production, and exports of nonferrous metals (1939 and 1950). (A4)

244-A. The Research Engineer in the Iron and Steel Industry. Frances Mortimer. *Engineer,* v. 192, Sept. 14, 1951, p. 344-346.

Procedures carried on by the engineering division of the British Iron and Steel Research Assoc. Various projects undertaken. (A9)

245-A. Metals for the High-Speed Age. John D. Sullivan. *Engineering and Mining Journal,* v. 152, Sept. 1951, p. 82-84.

Materials used in jet turbines, electronics, and similar new applications. Future supplies of critical materials are considered. (A4, T general)

246-A. What is the Outlook for Materials? Panel of Experts Discusses Supply Situation. *Industrial Gas,* v. 30, Sept. 1951, p. 14-15, 30.

Panel discussion under the following headings: pattern of metal use, steel manufacturing capacity, nonferrous and light metals, organic and heavy chemicals. A chart illustrates U. S. consumption and production of some vital materials. (A4)

247-A. Aluminum: Growing Giant in Metal Scene. Bob Hatschek. *Iron Age,* v. 168, Sept. 20, 1951, p. 71-72.

Future markets for Al. A factor affecting commercial production is the need of low-cost electrical power. (A4, Al)

248-A. Aluminum Scrap Recovery Saves 5 Million Lb. Herbert Chase. *Iron Age,* v. 168, Sept. 27, 1951, p. 94-98.

Since all Chrysler cars use cast aluminum alloy pistons that are finished in the corporation's own plants, a sizable tonnage of chips results from machining operations. The recovery procedure. (A8, Al)

249-A. Magnesium Alloy Dust Collection. *Light Metals,* v. 14, Sept. 1951, p. 508-509.

A unit dust collector called "Multiswirl" designed to handle Mg could adequately handle metallic Ti and Zr dust. (A8, Mg)

250-A. The Inquisitive Steelman. James E. Payne. *Steelways,* v. 7, Sept. 1951, p. 1-4.

The importance of research in the phenomenal rise in quantity and quality of steel production. (A9, ST)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

251-A. Costs Cut by Simplified Welding Operations. Howard E. Jackson. *Industry & Welding,* v. 24, Oct. 1951, p. 52-54, 59, 108-109.

How factory-wide simplicity is achieved by use of expandable type buildings and fabricating production lines, and by efficient plant layout and low cost handling procedures. (A5, K general)

252-A. Uncle Sam Wants to Buy These Aluminum Products. Part I. *Iron Age,* v. 168, Oct. 4, 1951, p. 236-238.

A list of products needed by the armed services with information on how to obtain orders to make these items. (A4, Al)

253-A. Modern Industries Depend on Electroprocesses. Charles L. Faust. *Journal of the Electrochemical Society,* v. 98, Oct. 1951, p. 133C-137C.

Dependence of industries on electroprocesses. Tables show the products made from the process and some of the major industries involved. (A4)

254-A. One World in Metallurgy. *Steel,* v. 129, Oct. 8, 1951, p. 116-119, 172, 175, 178.

Symposium on some of the thinking, prejudices, desires and confusions occupying the attention of leading metals specialists in the world. Based on interviews with conferees to the World Metallurgical Congress in Detroit. (A general)

255-A. Who Has the World's Metals. *Steel,* v. 129, Oct. 8, 1951, p. 120-124, 143, 146, 148, 150, 152, 154, 158, 161-162, 164, 166, 169.

Data on world mine production of metals. Sources of new supplies, prices and uses of imported metals. (A4, B10)

256-A. Steel Industry Statistics. *Steel,* v. 129, Oct. 1, 1951, p. 121-136.

Tabulated data on pig iron, coke, steel ingots, and finished steel production by companies and plant location. Canadian statistics are included. (A4, ST, Fe)

257-A. Reshuffle of Steel's Top-Dog Ratings. *Business Week,* Oct. 13, 1951, p. 102.

Chart shows prewar, postwar and the present standing of steel producers. (A4, ST)

258-A. Copper—Supply and Demand. *Stove Builder,* v. 16, Oct. 1951, p. 60, 64, 66, 68, 70.

Economic analysis. (A4, Cu)

259-A. Industrial Metallurgy at Birmingham University. Foreword. A. J. Murphy. *General Organization:* **Metal Working Section.** A. R. E. Singer. **Melting and Casting Section of the Aitchison Laboratory.** V. Kondic. *Metal Industry,* v. 79, Sept. 21, 1951, p. 235-239, 243; Sept. 28, 1951, p. 263-265.

General facilities in the laboratories of the university which were designed to enable both teaching and research to proceed simultaneously. Metal-working equipment is described in detail. (A3)

260-A. Crisis in Metallurgy. Georg Masing. *Metal Industry,* v. 79, Sept. 28, 1951, p. 257-259.

The conflict of theoretical and technological trends. The widening gulf between the two approaches is not limited to Germany, but is even more strikingly apparent in America. Recommendations for reversal of this trend. (A3)

261-A. The British Iron and Steel Research Association. *Metallurgia,* v. 44, Sept. 1951, p. 125-128.

Work of various divisions of this association in ironmaking, steelmaking, mechanical working, plant engineering, and metallurgy. (A9, D general)

262-A. The British Non-Ferrous Metals Research Association. W. L. Hall. *Metallurgia,* v. 44, Sept. 1951, p. 129-132.

Progress made in long-range researches as well as special steps taken to assist industry in its efforts to economize in the use of certain metals and to find substitutes. 27 ref. (A9, EG-a)

263-A. Iron and Steel Industry in India. P. E. Mehta. *Metal Progress,* v. 60, Oct. 1951, p. 93-96, 218, 220, 222, 224.

Includes raw-material sources and map. (A4, B10, ST)

264-A. Russian Metallurgical Texts. N. H. Polakowski. *Metal Progress,* v. 60, Oct. 1951, p. 108-109.

Discusses recent article by Zapffe (item 229-A, 1951). Criticizes the quality of Russian metallurgical work. Several specific points indicate that the Russians are considerably behind the Western nations in metallurgy and metalworking. (A3)

265-A. Steel Company of Wales. *Sheet Metal Industries,* v. 28, Sept. 1951, p. 789-808.

Details of plant and equipment. The production of steel sheets is outlined step-by-step. (To be continued). (A4, ST)

266-A. (Book) **Mechanische Technologie.** (Mechanical Technology). A. Kopecky and R. Schamschula. 363 pages. 1951. Springer-Verlag, Vienna, Austria.

The present status of metals and other materials, their properties and structures, forming, heat treating, methods of testing and measurement and of applying surface coatings. (A general)

267-A. (Book) **Guide to Foreign Sources of Metallurgical Literature.** John T. Milek. 95 pages, 1951. Richard Rimbach Associates, 921 Ridge Ave., Pittsburgh 12, Pa. $2.50.

Nine sections give lists of foreign metallurgical associations, societies, institutions; periodicals, transactions, proceedings; metallurgical abstract services; foreign standardizing organizations; statistical sources; directories of metallurgical industries; metallurgical books; bibliographies, technical and special reports; and metallurgical abbreviations. (A10)

268-A. (Book) **The Metallic Raw Materials: Their Occurrence and Economic Importance. Vol. 9. Lead and Zinc.** (In German.) G. Berg, F. Friedensburg and H. Sommerlatte. 468 pages. 1950. Ferdinand Enke Publishing House, Hasenbergersteige, Germany. Stitched, 70 D. M.; Bound, 73.50 D. M.

Divided into two main sections: "General," and "Individual Countries." The first section contains chapters on the concentration and smelting of Pb-Zn ores, and on uses and history of the two metals. The second section forms the major part of the book and covers 63 countries. (A4, B general, C21, Pb, Zn)

269-A. (Book) **Year Book of the American Bureau of Metal Statistics.** Ed. 30. 112 pages. 1951. American Bureau of Metal Statistics, 50 Broadway, New York City. $3.00.

Covers largely the same field as previous issues. Statistics relating to copper, lead and zinc, gold and silver and other nonferrous metals. (A4, EG-a)

270-A. (Book) **Handbuch der Deutschen Wissenschaft.** (Handbook of German Science.) Vols. I and II. 1561 pages. 1949. Fr. K. Koetschan Verlag, Berlin, Germany.

Vol. I lists libraries and personnel of German universities, technical schools, medical, theological and law schools, and gives pertinent information on scientific institutes, museums, libraries, archives, societies, and journals. Vol. II contains an alphabetical listing of personnel (with brief personal facts and publications, and listings according to field of endeavor. (A10)

B

RAW MATERIALS AND ORE PREPARATION

248-B. Notes on Ore Dressing Practice at North Broken Hill Limited. W. R. Miller. *Australasian Institute of Mining and Metallurgy, Proceedings,* Sept. 30-Dec. 31, 1948, p. 41-99.

A comprehensive survey of methods and practices in the recovery of Pb, Ag and Zn. Factors influencing the grade of concentrate products, plant control and costs. (B14, Pb, Ag, Zn)

249-B. More Plant for More Alloys for More Steel. *Business Week,* Oct. 6, 1951, p. 66-68, 73-74, 76.

New plant being built at Marietta, Ohio, by the Union Carbide & Carbon Corp. will increase the capacity of the Electro Metallurgical Division. Demand for ferro-alloys in the steel industry with particular reference to low-carbon ferrochrome, an alloy which helps cut down corrosive attack. (B22, AY, Fe-n)

250-B. Increased Metal Output, Improved Product Quality, Increased Furnace Life Through New Developments in Metallurgical Refractories. W. F. Rochow and J. S. McDowell. *Journal of Metals,* v. 3, Oct. 1951, p. 846-853.

Selection of refractories for nonferrous furnace construction. Properties of basic refractories are graphed and tabulated. Tests were made on the action of CuO_2 on basic brick of various types and on several other refractories. (B19, C21)

251-B. Tungsten: A Critically Needed Defense Element. Chung Yu Wang. *Journal of Metals,* v. 3, Oct. 1951, p. 854-857.

Production and applications to industry. Methods of beneficiation of the raw material and future sources. (B10, B14, T general, W)

252-B. The Stuerzelberg Process. C. W. Jensen. *Mining Magazine,* v. 85, Sept. 1951, p. 144-146.

Process was developed in Germany to treat cinders of Meggen pyrites in a revolving furnace in order to recover their iron content in the form of a refined pig iron (low in S and P) and their Zn content in the form of zinc oxide. The process and its advantages. (B15, Fe)

253-B. Potential Sources of Iron Ore Bolster Conservation Program. Owen R. Rice. *Steel,* v. 129, Oct. 1, 1951, p. 88, 91.

The depletion of iron-ore reserves in the U. S. Potential sources are considered. (B10, Fe)

254-B. Calcium Cyanamid; A Source of Nitrogen in Steel. *Steel,* v. 129, Oct. 8, 1951, p. 138, 140.

Experience shows that nitrogen promotes aging or precipitation hardening, affects grain sensitivity and increases hardness and tensile strength of steel. Methods of introducing nitrogen by additions of calcium cyanamid; its composition and availability. (B22, D general)

255-B. Colloid-Chemical Problems in the Separation of Red Mud From Aluminate Solution; Under Conditions of the Bayer Process. (In German.) E. Herrmann, I. Dvornik, O. Korelic, and V. Matkovic. *Kolloid Zeitschrift,* v. 123, July 1951, p. 22-33.

Experiments to discover cause of, and method of eliminating, the poor classification of red mud. An effective method of accelerating the settling of the sludge was determined. The colloidal character of the "mud" is briefly discussed. (B14, Al)

256-B. Reducibility of Ferrous Metals With High Titanium Oxide Content. (In Portuguese.) George Soares de Moraes. *Boletim da Associacao Brasileira de Metais,* v. 7, Apr. 1951, p. 161-175.

Minerals containing 60% Fe and 13.6% TiO_2 were studied with particular emphasis on rate of reduction at various temperatures. 26 ref. (B14, Fe, Ti)

257-B. The Production of Alumina from Alunite. N. S. Bayliss, W. E. Ewers, and G. L. Miles. *Australian Journal of Applied Science,* v. 2, June, 1951, p. 267-275.

A process for producing pure alumina from alunite is proposed. The residues obtained after extracting K_2SO_4 from calcined alunite are leached with hot HCl, hydrated $AlCl_3$ is precipitated from the solution by increasing the concentration of HCl to 30%, and the chloride is ignited to give Al_2O_3, HCl, and water. Several steps in the process were tested in a pilot-plant scale. (B14, Al)

258-B. Ferrochromium From Low Grade Ore Finds Wide Use. J. J. Grady. *Iron Age,* v. 168, Oct. 18, 1951, p. 95-98.

Properties and applications of exothermic ferrochromium alloys made from low-grade ores by the Udy process. Various advantages. (B22, D general, ST, Fe-n)

259-B. Destruction of Flotation Froth With Intense High-Frequency Sound. Shiou-Chuan Sun. *Mining Engineering,* v. 3, Oct. 1951, *Transaction of American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 865-867.

Data indicate that sound waves can be employed for continuous and instantaneous defrothing. A powerful high-frequency siren was used. 12 ref. (B14)

260-B. Tungsten. Chung Yu Wang. *Mining Engineering,* v. 3, Oct. 1951, p. 853-856.

Previously abstracted from *Journal of Metals.* See item 251-B, 1951. (B10, B14, T general, W)

261-B. Mineralogical-Microscopic Investigation of Extremely Fine Beneficiation Products. (In German.) Hans Ehrenberg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 4, Aug. 1951, p. 285-293.

Object of the studies was to determine suitability of polarization, beneficiation, and "Ultrapak" microscopes for above purpose. The beneficiation microscope was found suitable for the rapid study of fine opaque and transparent minerals of all kinds. Photographs, photomicrographs (some in color), and tabular data. (M21, B14)

262-B. Three-Phase A. C. Can Improve Fine-Size Magnetic Separation. Sven Eketorp. *Engineering and Mining Journal,* v. 152, Oct. 1951, p. 82-83, 118.

Construction details and operational data on a magnetic separator built to operate on 3-phase a. c. It has been used for concentration of magnetites as well as iron powder. 14 ref. (B14, Fe)

C

NONFERROUS EXTRACTION AND REFINING

118-C. Carbon, Oxygen, and Sulphur Content of Chilean Coppers as Related to Cuprous-Oxide Rectifiers. C. C.

Hein and W. M. Hickam. *Journal of Applied Physics,* v. 22, Sept. 1951, p. 1192-1195.

Several Chilean coppers used in cuprous oxide rectifier work were analyzed for C, O_2, and S. The carbon determinations were in agreement with published solubility data. Large differences were found in the O_2 and S content which were correlated with refining data of the Cu and the reverse leakage currents of the rectifiers. The change in sulfur content caused by various heat treatment also was investigated. (C21, J general, Cu)

119-C. Formation of a Titanium Slag by Selective Fusion Reduction of Ilmenite. (In French.) André Chrétien and William Freudlich. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 233, July 30, 1951, p. 413-415.

Almost complete separation of Ti and Fe can be effected in presence of C and Na_2CO_3 in suitable proportions, if temperature is strictly maintained between 1210 and 1340° C. (C21, Ti, Fe)

120-C. Strategic Tin Production Is Up to the Lone Star Smelter. *Engineering and Mining Journal,* Oct. 1951, p. 84-87.

The smelter treats lower grade ore than can be handled anywhere else in the world. (C21, Sn)

121-C. Small Scale Refining of Gold. L. L. Colin. *South African Mining and Engineering Journal,* v. 62, Sept. 1, 1951, p. 21-23.

Change in emphasis from large to small operations and advantages of the chlorine over the electrolytic process. (C4, C23, Au)

122-C. Semi-Pilot-Plant Investigations on Electrowinning Manganese From Chloride Electrolytes. J. H. Jacobs, P. E. Churchward, T. E. Hill, Jr., W. H. Curry, E. C. Perkins, and O. Q. Leone. *U. S. Bureau of Mines,* Report of Investigations 4817, Sept. 1951, 13 pages.

Results, advantages and disadvantages of the process. (C23, Mn)

D

FERROUS REDUCTION AND REFINING

300-D. Basic Refractories and Slag for Electric Steel Furnaces. A. H. Thomson. *American Foundryman,* v. 20, Sept. 1951, p. 52-54.

Use of acid refractories for basic roofs, spalling caused by temperature changes, and magnesite vs. dolomite. (D5, ST)

301-D. Basic Open-Hearth Furnaces. H. K. Work and H. M. Banta. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 3-32.

General features of furnace construction, slag pockets and regenerators, furnace control and maintenance, and miscellaneous and auxiliary equipment. 17 ref. (D2, ST)

302-D. Survey of Open-Hearth Operations. T. S. Washburn. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 33-58.

A general outline of the basic openhearth process. The discussion is limited to the sequence and purpose of the operations, illustrated by data and examples. (D2, ST)

303-D. Open-Hearth Refractories. R. B. Sosman, A. W. Robinson, and W. S. Debenham. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 59-80.

Raw material used. Construction and maintenance. 11 ref. (D2)

304-D. Open-Hearth Fuels, Combustion, and Instrumentation. H. V. Flagg, R. A. Lambert, and B. M. Larsen. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 81-153.

A practical discussion of the various features of open-hearth practice and instrumentation related to the efficient heating of the furnace, control of temperature, and protection of the furnace structure from accidental overheating. 24 ref. (D2, S16)

305-D. Raw Materials. T. L. Joseph, T. S. Washburn, and G. L. Plimpton. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 154-189.

Raw materials of basic openhearth process that are important in determining the composition of steel or slag. They are the metallic charge, oxygen-bearing materials, fluxes, alloying and deoxidizing additions, and certain refractory materials used for maintenance of bottoms. 36 ref. (D2, B21, B22, ST)

306-D. Slag Control. W. O. Philbrook and F. M. Washburn. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 190-254.

Techniques and methods. Calculation of slag weight and slag analysis. Objectives and limitations of slag control. 39 ref. (D2, ST)

307-D. Charging and Melting Practice. Michael Tenenbaum, W. O. Philbrook, and F. M. Washburn. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 255-293.

General and specific charging and melting practices. 13 ref. (D2, ST)

308-D. Refining Practice. W. O. Philbrook, Michael Tenenbaum, and F. M. Washburn. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 294-338.

Shaping slag; oreing practice; decarbonization by oxygen injection; control of bath composition and temperature; fuel, air, and draft practice; and duplex practice. 23 ref. (D2, ST)

309-D. Finishing and Deoxidation Practice. H. Ross and R. K. Kulp. *American Institute of Mining and Metallurgical Engineers.* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 339-393.

Different types of ingot structures and finishing operations of the refining. Illustrates actual basic openhearth practice by including four heat logs. 19 ref. (D2, D9, ST)

310-D. Molds and Pouring Practice. H. J. Forsyth and L. G. Ekholm. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 394-433.

Mold design, types of molds, and pouring practice. 14 ref. (D9, ST)

311-D. Ingot Structure and Segregation. James W. Halley. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 434-458.

Ingot structures of killed, semikilled, and rimmed steels and processes of solidification leading to them. 13 ref. (D9, M27, ST)

312-D. Nonmetallic Inclusions. C. E. Sims. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 459-489.

Nature and constitution, origin, cleanness, and detection of nonmetallic inclusions in steel. 30 ref. (D9, M27, ST)

313-D. Physical Chemistry of Slag-Metal Reactions. Gerhard Derge and Michael Tenenbaum. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 691-748.

Attempts to indicate the present state of knowledge regarding the constitution of basic slags. Two general concepts of slag constitution—molecular association hypothesis and ionization concept—have been developed and both have met with some success. 41 ref. (D2, P12, ST)

314-D. Physical Chemistry of Open-Hearth Refractories. R. B. Sosman. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 749-772.

Physics and chemistry of the individual refractory, materials, and the causes of faliure of open-hearth refractories. 17 ref. (D2)

315-D. Thermal Changes in Melting and Refining. Lawrence S. Darken. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 773-794.

Calculation of thermal effects of additions to bath and the heat balance of metallurgical reactions. (D2, P, ST)

316-D. Gas Flow and Heat Transfer. B. M. Larsen. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 795-834.

An introduction to the problems of flow of gases through the furnace system and the flow of heat in this system. Some of the conditions of heat and gas flow peculiar to the openhearth. 11 ref. (D2, ST)

317-D. Furnace Efficiency and Available Heat From Fuel. B. M. Larsen. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 835-866.

Deals with the heat quantities involved in openhearth steelmaking, including thermal efficiency of the furnace as a generator of high-temperature heat, heat storage in the steel and slag produced and in the furnace walls, and heats of the various chemical reactions involved in combustion, in formation of slag, and refining of steel. (D2, ST)

318-D. Rates of Open-Hearth Reactions. B. M. Larsen. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 867-905.

Rates of reactions at high temperatures, the oxidation of C, Si, and Mn, and the reactions in finishing the heat. (D2, ST)

319-D. Practical Aspects of Duplexing. E. Kay. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Aug. 1951, p. 33-36; disc., p. 36-37.

Three methods of duplexing cupola metal, in the rotary furnace, air furnace, and electric furnace. Advantages of the rotary furnace used in the author's plant. Use of acid-hearth reverberatory-type air furnaces and electric furnaces as duplexing units. (D7, E10, CI)

320-D. Measurement and Control in the Utilization of Mixed Fuels and Oxygen in Open-Hearth Furnaces. Martin J. Conway and Edward H. Cauger. *Instruments,* v. 24, Sept. 1951, p. 1028-1034.

Instrumentation and combustion techniques which have made it possible for openhearths designed for 60-ton heats to produce heats of 170 tons with reduced fuel consumption

per ton and increased checker life. Fuel temperature, viscosity, and flow are controlled, as are furnace pressure, oxygen flow, and air flow. (D2, S18, ST)

321-D. Continuous Steel Casting Pilot Plant Proves Successful. D. I. Brown. *Iron Age*, v. 168, Sept. 20, 1951, p. 113-118.

Rounds up to 7 in. diam. and slabs up to 3x15 in. are now being continuously cast and used as semifinished products to feed conventional rolling mills. Carbon and stainless steels were cast with equal success. (D9, CN, SS)

322-D. Blast Furnace Inwall Rebuilt at Algoma. D. Joyce and J. Laidlow. *Iron and Steel Engineer*, v. 28, Sept. 1951, p. 75-80; disc., p. 80.

How the inwall of a furnace was replaced without removing the stockline section. (D1, Fe)

323-D. Effect of the Composition of Minerals on Their Use in Blast Furnaces. (In French.) J. Laborne. *Métallugie et la Construction Mécanique*, v. 83, Aug. 1951, p. 573-577.

Studies mathematically the proper proportions of SiO_2 and CaO in slag for blast-furnace operations. (D1, Fe)

324-D. British Report on All-Basic Openhearths. Max Davies. *Iron Age*, v. 168, Oct. 4, 1951, p. 225-228.

Six furnaces in the United Kingdom and Holland which have completed five campaigns. Indicated advantages include: increased output, reduced man-hours for brick laying, less slag bulk, reduction in shutdown time and the most advantageous use of liquid fuels. Built-in pressure indicators help with design and construction. (D2)

325-D. Increasing Bessemer Production. *Metal Progress*, v. 60, Sept. 1951, p. 130, 132, 134. (Condensed from "Oxygen as a Means of Increasing Bessemer Production," W. G. McDonough.

Previously abstracted from *American Iron and Steel Institute*, Preprint, 1951. See item 176-D, 1951. (D3, ST)

326-D. Gas Velocity Faster in Blast Furnace Stock Columns. S. P. Kinney. *Steel*, v. 129, Oct. 1951, p. 87.

Observations were made on a column of stock consisting of ore, coke and stove. Calculations to determine the free area of the stock on a given plane. (D1, Fe)

327-D. Oxygen as a Means of Increasing Bessemer Production. I. W. G. McDonough. *Industrial Heating*, v. 18, Sept. 1951, p. 1595-1596, 1598, 1600, 1602, 1680.

Bessemer plant layout and operation at National Works Plant, McKeesport, Pa., as well as the oxygen plant and piping system. Experimental oxygen blows, varying oxygen volume, rate of flow and time of input. (To be continued.) (D3, B22, ST)

328-D. A New Process for Direct Reduction of Iron Pyrites. Antonio Scortecci and Massimo Scortecci. *Metal Progress*, v. 60, Oct. 1951, p. 72-75.

Process based on the dissociation of pyrites in the absence of air, and in the presence of C, with the formation of Fe and CS_2. The S content of the pig iron so obtained can be kept at low and technically acceptable values by methods dictated by economic conditions. Practically all the iron present is recovered as pig iron. The CS_2, recovered from small-scale tests, contains as much as 60% of the original S. Chemical reactions, power requirements, and industrial possibilities. (D8, Fe)

329-D. Bessemer Steel Low in Nitrogen and Phosphorus. Pierre Coheur. *Metal Progress*, v. 60, Oct. 1951, p. 78-80.

Development of a satisfactory process for the above by several Belgian organizations. The metal is blown with oxygen-enriched air or other gases. The development work included experiments with the converters themselves, extensive chemical analysis and physical tests of the steels produced, and a statistical study on more than 400 test blows. (D3, ST)

330-D. Effect of Sinter on Blast Furnace Production. *Metal Progress*, v. 60, Oct. 1951, p. 162, 164, 166. (Condensed from "The Effect of Sinter on Blast Furnace Production as Determined by Analysis of Daily Operating Data," W. E. Marshall.)

Previously abstracted from *American Iron and Steel Institute*, Preprint, 1951. See items 177-D and 209-D, 1951. (D1, Fe)

331-D. Instruments in Steel Making. Dr. A. H. Leckie. *Times Review of Industry*, v. 5, Oct. 1951, p. 22-24.

Includes diagrams on typical panels for openhearth furnaces. (D2, S16, S18)

332-D. Effect of Form and Care on the Life of Steel Mill Chill Molds. (In German.) Erich Folkhard. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 96, Aug. 1951, p. 169-172.

Graphs show results of systematic study. 10 ref. (D9, ST)

333-D. (Book) **Basic Open Hearth Steelmaking. Ed. 2.** W. O. Philbrook and M. B. Bever, editors, 940 pages, 1951. American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, N. Y. $8.00.

Presents the text under two main headings: practice and principles. The chapters under each are abstracted separately. (D2, ST)

E

FOUNDRY

513-E. Rigid Controls and Standards Improve Duplexing Operations. F. Coghlin, Jr. *American Foundryman*, v. 20, Sept. 1951, p. 24-27.

Standards for materials, equipment, operational procedures, and personnel training practiced in connection with successful malleable duplexing-melting operations. (E10, D7, CI)

514-E. Dropping the Cupola Bottom. *American Foundryman*, v. 20, Sept. 1951, p. 31. (Reprinted from article by James Timbrell, *Foundry Trade Journal*, v. 90, May 10, 1951.)

Recommends a cupola-bottom arrangement that makes dropping the bottom of a cupola an easy, safe operation. (E10, CI)

515-E. Controls for Green Working Strengths of Molding Sands. H. W. Dietert. *American Foundryman*, v. 20, Sept. 1951, p. 32-34.

Methods for complete control of green strength and green deformation of molding sands, by which either may be increased or decreased and controlled independently at selected levels. (E18)

516-E. Modern Foundry Methods: Unusual Equipment Employed to Make Centrifugally Cast Brake Drum. *American Foundryman*, v. 20, Sept. 1951, p. 36-39.

Equipment and procedures used to make steel brake drums for Centrifugal Fusing Co., Lansing, Mich. (E14, CI)

517-E. Mg-Zr Casting Alloys Attain High Strength-Weight Ratios. H. J. Millward. *American Foundryman*, v. 20, Sept. 1951, p. 44-47.

Sand and gravity die castings of Mg-Zr alloys have found many applications in airplane parts and turbojet engines. Extensive research developed a satisfactory method of introducing Zr into Mg, and the alloy has high strength-weight ratios and excellent mechanical properties. Melting, casting, and heat treating practices, and alloy properties. (E11, E13, Q general, Mg)

518-E. Some Experiments in Preparing Nodular Iron. W. P. Fishel and Robert C. Bramlette. *American Foundryman*, v. 20, Sept. 1951, p. 55-56.

Experiments reported shed some light on the temperature at which the nodules begin to form and the phase from which they originate. Results substantiate findings of previous researchers as to conditions needed for nodular-iron production. They are: a highly reducing metal as a reducing agent; an iron composition that will readily graphitize; and addition of about 0.5% Si as ferrosilicon after addition of one of the nucleating agents. (E25, CI)

519-E. Pulverized Fuel Furnaces for Melting Malleable Cast Iron. H. W. Perrott. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Aug. 1951, p. 1-15.

Development of the modern air furnace and the application of pulverized-fuel firing. The ball-mill grinding system with central storage is compared with the unit-pulverizing system. Method of grinding the fuel and distributing it to the furnace, and performance of different types of pulverized fuel-fired installations. Details of melting practice and fuel consumption. (E10, B18, CI)

520-E. The Sesci Furnace. P. C. Fassotte. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Aug. 1951, p. 17-20; disc., p. 26-31.

The object of the designer of the Sesci furnace was to reconcile two fundamental requirements in the production of malleable cast iron—high temperatures and uniform metal composition. Seven examples of melting practice in various sizes of Sesci furnace, ranging from 2 to 6 tons in capacity. Two of the examples refer to whiteheart malleable practice and the remainder to blackheart malleable. (E10, CI)

521-E. Oil-Fired Rotary Furnaces. W. D. Bullows. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Aug. 1951, p. 21-26; disc., p. 26-31.

Construction, operation, and fuel system of oil-fired rotary furnaces used in the author's plant, the fuel employed being creosote pitch. Positive air and oil control are employed to achieve metallurgical balance in the furnace, to obtain known melting times in order to balance mechanized production, and to increase the life of recuperator tubes. Results of three typical days' malleable-iron melting practice are tabulated. (E10, CI)

522-E. Measurement of Plastic Flow in Moulding Sands. A. Jamieson. *Foundry Trade Journal*, v. 91, Sept. 6, 1951, p. 271-277.

An investigation to establish a means of evaluating the working properties of molding sands and to define the properties of plasticity and flowability in scientific terms. (E18)

523-E. Dust in Foundry Operations. *Foundry Trade Journal*, v. 91, Sept. 13, 1951, p. 309-314.

Presents a discussion on papers previously abstracted: "Reduction of Dust in Steel Foundry Operations", W. A. Bloor; and "Observation and Control of Dust in Foundry Dressing Operations", R. F. Ottignon and W. B. Lawrie. (See items 427-E and 492-E, 1951) New points on the in-

terpretation of data in relation to iron foundries and other methods of dust estimation and advice on dust photography are given.
(E24, A7, CI)

524-E. Aluminum Casting Alloys. *Foundry Trade Journal,* v. 91, Sept. 13, 1951, p. 315-319.

A discussion on two papers previously abstracted: "Casting Characteristics of Some Aluminum Alloys", D. C. G. Lees. (See item 371-E and 396-E, 1951) and "DTD 424—The Versatile Light Alloy," A. P. Fenn (see item 501-Q, 1951).
(E25, Q general, Al)

525-E. Steel Foundry Progress; Reorganization by Osborn Foundry & Engineering Co. *Iron and Steel,* v. 24, July, 1951, p. 327-330; Aug. 1951, p. 382-386; Sept. 1951, p. 417-419, 422.

Principal changes in a British foundry for more efficient operations. Layout, equipment, and methods. (E general, CI)

526-E. The Grain Refinement of Aluminum Alloy Castings by Additions of Titanium and Boron. A. Cibula. *Journal of the Institute of Metals,* v. 19, Sept. 1951, p. 1-16.

By centrifuging the particles from molten alloys containing B but no Ti and observing the change in grain-size produced, evidence was obtained that nuclei in these alloys are AlB_2 crystals. The minimum B addition for adequate refinement of these alloys therefore depends mainly on solubility of AlB_2 in molten Al. Attempts to increase concentration of TiC in alloys containing Ti were unsuccessful. Addition of B instead of C was more effective in producing refinement. Grain refinement of some commercial casting alloys by simultaneous additions of Ti and B was studied in detail. Alternative methods of adding these elements and refinements produced by borides of transition metals other than Ti were investigated. 18 ref. (E25, Al)

527-E. Die Casting Continuous Assemblies. H. K. Barton. *Machinery* (London), v. 79, Aug. 30, 1951, p. 379-386.

Features of design that are necessary for the production of continuous assemblies. Various applications.
(E13)

528-E. Furnaces for Light-Alloy Melting; Comparative Metallurgical Value of Two Different Types. Jean Trainier. *Metal Treatment and Drop Forging,* v. 18, Sept. 1951, p. 416-418.

A study of the low-frequency induction furnace and the gas-fired reverberatory furnace for light-alloy melting. Examines the relationship between loss in melting, oxide contamination, and gas porosity for each. (E10, Al, Mg)

529-E. Pre-Fabricated Construction: Locking Parts of New System Are Made by Die Casting. Alan T. Cazier. *Precision Metal Molding,* v. 9, Sept. 1951, p. 32-35, 77.

Die-cast Al parts used to lock extruded Al channels together to form frameworks for all types of building. (E13, T26, Al)

530-E. Special Machines Have Several Design Factors That Favor the Use of Investment Casting. *Precision Metal Molding,* v. 9, Sept. 1951, p. 36-37, 84.

Use of stainless steel and Stellite in jaw chucks. (E15, SS SG-j)

531-E. Over the Flame an Aluminum Permanent Mold Casting Takes 800 F. Without Blistering. Julius Klein. *Precision Metal Molding, v.* 9, Sept. 1951, p. 41, 91, 92.

By careful designing, the mechanical trimming of a permanent mold griddle casting can be reduced to a minimum series of operations that compare favorably with trimming costs of other casting methods.
(E12, Al)

532-E. Cams, Bearings, and Structural Parts by Die Casting and Powder Metallurgy. *Precision Metal Molding,* v. 9, Sept. 1951, p. 42-44, 87.

Production and applications of parts cast in Al, Cu-base alloys, and Zn-base alloys.
(E13, H general, Al, Cu, Zn)

533-E. Castings Made in Plaster Molds: the Process, Design Factors, Alloys, Tolerances and Advantages. K. A. Miericke. *Precision Metal Molding,* v. 9, Sept. 1951, p. 49-50, 56-58, 87-89.

The plaster is usually compounded with various types of fibrous and refractory aggregates such as fibrous talc and finely ground silica, pumice stone, clay or graphite. Design applications. (E16)

534-E. Light and Strong Construction Obtained with Die Casting, Investment Casting, Permanent Mold Casting and Powder Metallurgy. *Precision Metal Molding,* v. 9, Sept. 1951, p. 52-55.

Production of a portable power saw which utilizes the above methods for its various components.
(E12, E13, E15, H general, Cu, Be, Al)

535-E. 12,000 Psi Yield Strength Required of Permanent Mold Casting. Wayne Martin. *Precision Metal Molding,* v. 9, Sept. 1951, p. 59, 90.

Application of Al and Mg alloys for permanent mold castings. Mechanical properties are tabulated.
(E12, Q general, Al, Mg)

536-E. Small Gear Housings: When Is It Practical to Produce a Transmission Case by Investment Casting. L. W. Millin. *Precision Metal Molding,* v. 9, Sept. 1951, p. 60, 87.

Application and examples. (E15)

537-E. Cupola Melting. R. W. Ruddle. *Australasian Engineer,* Aug. 7, 1951, p. 84-88.

Fundamentals which must be controlled if casting defects are to be kept at a minimum. Cupola design, quantity of air required, bed height, tapping the molten iron, and size of material. (E10, CI)

538-E. Ceramic Molds for Casting Metals, Thomas A. Dickinson. *Ceramic Age,* v. 58, Sept. 1951, p. 21, 23, 29, 41.

Ceramic molds offer high heat resistance combined with low thermal conductivity; relatively great chemical inertness at the temperatures required to melt a majority of commercial alloys; and qualities which permit fabrication of accurate molds at relatively low costs. (E19)

539-E. Melting Control Pays Off in Malleable Foundry. Edwin Bremer. *Foundry,* v. 79, Oct. 1951, p. 98-101, 264-266.

Installation of a cupola-electric furnace process to permit closer control of melting as well as of the resulting iron. (E10)

540-E. The Pattern Engineer and the Foundry. G. A. Pealer. *Foundry,* v. 79, Oct. 1951, p. 102-103, 258-259.

Need for closer cooperation between industrial foundries and patternmakers. Various examples of the choices available in pattern equipment and recommendations for selection and design. (E17)

541-E. Study of Metal Flow in Sand Molds. George Di Sylvestro. *Foundry,* v. 79, Oct. 1951, p. 104-109, 200-201.

Experiments show the efficiency of the procedure for study of metal flow. Cost of this type of research.
(E25)

542-E. Casting Surfaces Produced in Olivine Molding Sand. Gilbert S. Schaller. *Foundry,* v. 79, Oct. 1951, p. 110-113, 260-263.

Tests were conducted to study the quality of casting surfaces. Methods employed are offered as a possible standard for casting-surface investigation. (E25)

543-E. Reinforced Plastic Core Driers Developed for Electronic Baking. Frances A. Vainosky. *Foundry,* v. 79, Oct. 1951, p. 144, 147.

Core dryers are made from American Cyanamid's Laminar Resin reinforced with fiberglas. Techniques employed. (E21)

544-E. Cast Aluminum Saucer Used in Radio Research. *Foundry,* v. 79, Oct. 1951, p. 167.

Production of a cast Al saucer 50 ft. in diam. The saucer was cast in pie-shaped sections and was assembled on one of the buildings at Naval Research Laboratory, Washington. (E11, T1, Al)

545-E. Manufacture of Propellers and Other Castings. C. W. Stewart. *Foundry Trade Journal,* v. 91, Sept. 13, 1951, p. 301-306; disc., p. 306-308.

Procedures at a 60-year-old British iron foundry. Although it uses outdated methods, it manages to turn out castings which compare favorably both in appearance and cost with those made in modern establishments. (E11, CI)

546-E. Centrifugal Castings for Aircraft Engines. *Metal Progress,* v. 60, Sept. 1951, p. 116, 118, 122. (Condensed from "Centrispun High-Alloy-Steel Aero-Engine Components," A. E. Thornton and J. I. Morley.)

Previously abstracted from "Symposium on High-Temperature Steels and Alloys for Gas Turbines," *Iron and Steel Institute,* Feb. 1951. See item 429-E, 1951.
(E14, Q general, AY)

547-E. Foundry Processing of Copper Alloys With High Electrical Conductivity. (In Portuguese.) Clovis Bradaschia. *Boletim da Associacao Brasileira de Metais,* v. 7, Apr. 1951, p. 87-97.

Production technique; results obtained with various alloys; and practical applications. 10 ref.
(E11, P15, Cu)

548-E. Interpretation of Permeability Experiments on Molds. (In Portuguese.) Carlos Dias Brosch. *Boletim da Associacao Brasileira de Metais,* v. 7, Apr. 1951, p. 98-118.

Method and setup for the experiments. It is suggested that permeability values should be lower than generally permitted in order to correlate them with other properties, such as the thermal conductivity of the mold. (E19)

549-E. Interpretation of Experiments on Mold Resistance. (In Portuguese.) Carlos D. Brosch. *Boletim da Associacao Brasileira de Metais,* v. 7, Apr. 1951, p. 193-206.

A resistance experiment is described for the characteristic stages of "green", "dry", and "heated". Resistance to cutting, compressive, and tensile stresses was investigated and an interpretation of "green" resistance values in relation to "deformation" of the mold was established. (E19)

550-E. KO Risers Are OK. L. C. Hollien. *American Foundryman,* v. 20, Oct. 1951, p. 30-32.

Necked-down or knock-off risers, K.O. for short, are applied to types of castings requiring maximum efficiency of the riser in order to secure soundness. Shows that their application on steel castings for oil field service greatly reduces chipping and burning time. The area requiring scarfing and grinding to casting contour was reduced by 93%. (E24, CI)

551-E. Soil Mechanics Aids Study of Mold Behavior Under Vibration. Dallas M. Marsh. *American Foundryman,* v. 20, Oct. 1951, p. 36-39.

When a matchplate is vibrated and withdrawn from the mold, it is believed to be influenced by such fac-

tors as passive earth pressure, ratio of induced frequency to natural frequency of the molding-sand mass, and directional nature of vibrations. Further experimental work is recommended. (E24)

552-E. Gray Iron Heat Conservation. Ralph A. Clark. *American Foundryman*, v. 20, Oct. 1951, p. 40-43.

Careful analysis of metal-handling methods and minor changes in existing equipment can result in substantial reductions in the 300-400° F. temperature losses experienced in many foundries. Such simple measures as covering the cupola spout and providing covers for receiving and transfer ladles have proved effective in reducing melting costs and delivering metal to the mold at the proper pouring temperature. (E10, CI)

553-E. Graphite Nodules; A Note on Spherulization of Graphite in Cast Iron. F. H. Buttner, H. F. Taylor. and John Wulff. *American Foundryman*, v. 20, Oct. 1951, p. 49-50.

A possible explanation of nodular graphite formation in cast iron is offered by evaluation of interfacial energy between the liquid melt and the growing graphite particle. Equations are based on spherulitic growth and nucleation theories developed by other investigators, and the authors' work on surface energy. 12 ref. (E25, P10, CI)

554-E. Foundry Sand Control—No. 1 Enemy of Scrap. George W. Anselman. *American Foundryman*, v. 20, Oct. 1951, p. 52-57.

Poor foundry sand practice is said to be responsible for 22 of the possible 31 defects that can occur in the casting of gray iron. Of these, 11 defects are directly attributable to sand, which also may be a contributing factor in a dozen other defects. (E18)

555-E. How to Use the Cupola. Bernard P. Mulcahy. (Continued). *Foundry*, v. 79, Oct. 1951, p. 204, 207-208, 211.

Balanced blast and hot blast cupolas with an explanation of dehumidification of the blast. (To be continued.) (E10)

556-E. Studebaker Doubles Foundry Capacity. (Continued) Ray H. Moore. *Foundry*, v. 79, Oct. 1951, p. 114-119.

Molding and pouring cylinder blocks and smaller castings. Extensive facilities employed to control dust, smoke and fumes. (To be continued). (E11)

557-E. Operation and Design of Hot-Blast Cupolas. F. C. Evans. *Foundry Trade Journal*, v. 91, Sept. 6, 1951, p. 279-282.

The problems encountered. Diagrams on recuperator design to overcome the dust problem in the field. (To be continued). (E10, CI)

558-E. Synthetic Resins in the Foundry. *Foundry Trade Journal*, v. 91, Sept. 20, 1951, p. 345-350.

Discussion of I. B. F. sub-committee report. (July 5 issue, see item 401-E, 1951.) (E18)

559-E. Furnace Efficiency. *Iron and Steel*, v. 24, Oct. 1951, p. 487-490.

Uniformity of hearth temperature and full utilization of the heat input are two of the more important problems of iron and steel auxiliary furnacing. Improved designs for mold-drying ovens and heat treating furnaces in the foundry. (E19, J general)

560-E. Casting Design. C. T. Marek. *Machine Design*, v. 23, Oct. 1951, p. 190, 192, 194, 197. (A condensation).

General principles. (E general)

561-E. Permanent-Mold Casting of Steel in Aluminum Dies. *Machinery* (American), v. 58, Oct. 1951, p. 152-158.

Features of the process and current activities of the English company which patented the process. (E12, ST, Al)

562-E. Metal Melting and Handling in the Die Casting Shop. H. K. Barton and L. C. Barton. *Machinery* (London), v. 79, Sept. 27, 1951, p. 540-546.

The main requirements for an efficient metal-handling system. (E13)

563-E. The Research and Development Division of the British Steel Founders' Association. J. F. B. Jackson. *Metallurgia*, v. 44, Sept. 1951, p. 137-139.

A brief outline of the organization and three of the many fields of research in which it is already engaged—freezing mechanism of steel, mold refractories, and steel foundry dust. (E general, A9, CI)

564-E. High-Vacuum Melting. *Metallurgia*, v. 44, Sept. 1951, p. 163-164.

A newly developed Swiss plant consists of a simple tilting furnace with its accompanying mold, operating within a vacuum chamber. Ideal for melting special steels, copper, alloys with readily oxidizing constituents such as Ti, Zr, Mn, Cr and their alloys. (E10)

565-E. Improved Aluminum Bearings (Al-Sn and Al-Sn-Cu Alloys). H. K. Hardy, E. A. G. Liddiard, J. Y. Higgs, and J. W. Cuthbertson. *Metal Progress*, v. 60, Oct. 1951, p. 97-103, 224.

Experiments made on laboratory melts cast into standard round test bars, 6 in. long. Molds were either baked sand, Al bronze, or "water chill cast" (by pouring into a 1¼-in. cylindrical thin sheet-steel container and allowing water to rise in an outer container at such a rate that directional solidification occurred from the bottom of the ingot). These various molds were used to study the influence of rate of solidification on microstructure. (E25, M27, Al, SG-c)

566-E. Centrifugal Steel Casting in Permanent Molds. Part I. John Osborn Felt. *Tool Engineer*, v. 27, Oct. 1951, p. 41-43.

Procedures. Mechanical properties of various specimens are tabulated. (E14, Q general, CI)

F

PRIMARY MECHANICAL WORKING

249-F. Columbia's Cold Reduced Steel Products. Lawrence S. Dahl. *Blast Furnace and Steel Plant*, Sept. 1951, v. 39, p. 1084-1090.

Over-all operations of Columbia Steel Co.'s sheet and tin mill at Pittsburg, Calif., the only cold reduction mill of its kind in the western states. (F23, ST)

250-F. Centreless Bar Turners and Billet Peelers. W. Reichel. *Engineers' Digest*, v. 12, Sept. 1951, p. 301-304, 314. (Translated and condensed from *Stahl und Eisen*, v. 71, Feb. 15, 1951, p. 183-193.)

Investigates the peeling process. In contrast to cold-drawn shafting, peeled shafts were found to be free from internal stresses, grooves, and acid inclusions (no pickling is necessary), and there is no difference in strength between the surface and the core. (F29, ST)

251-F. Fundamentals of Forging and Forming. Hale A. Clark. *Industrial Gas*, v. 30, Sept. 1951, p. 13, 24-27, 29.

Preheating temperatures required; equipment, including hammers, upsetters and presses; batch type and continuous furnaces; and character and thickness of refractory materials. (F22, G1)

252-F. New Metal Treating Process Speeds Cold Working, Cold Extrusion of Steel. *Machine and Tool Blue Book*, v. 47, Oct. 1951, p. 153-154, 156, 158, 160.

A new metal treating chemical process greatly extends lubrication limits in the cold working of steel. It consists of compatible cleaning, pickling and application of a new phosphate coating and specially developed lubricants to steel. (F1, ST)

253-F. Brass and Bronze Forgings. Carl H. Phil. *Machinery Lloyd* (Overseas Ed.) v. 23, Sept. 1, 1951, p. 68-69, 71-72.

A survey. Applications in wartime production of irregularly shaped parts. (F22, Cu)

254-F. Die and Tool Steels for the Drop Forging Industry. (Concluded.) H. J. Merchant. *Metal Treatment and Drop Forging*, v. 18, Sept. 1951, p. 401-406.

Requirements of steels for roll forging dies, trimming presses and tools, trimming beds, and trimming punches. The treatment and care of forging plant is emphasized with some reference to surface treatment of dies to increase their life. (F22, T5, TS)

255-F. Press-Forging Light Metals for Aircraft. Harry Wilkin Perry. *Modern Industrial Press*, v. 13, Sept. 1951, p. 28, 32, 34.

Using a 75,000-ton forging press, metals are squeezed under high pressure into dies by only a few press strokes instead of many repeated strokes of a drop hammer. (F22, Al, Mg)

256-F. Some Principles of Continuous Wire Drawing. Clement Blazey and Vivian W. Benjamin. *Wire and Wire Products*, v. 26, Sept. 1951, p. 751-757, 798.

Information to assist both wire drawers and machine builders in their efforts to provide drawing conditions that are conducive to more efficient operation of equipment. The discussion is concerned with copper wire. (F28, Cu)

257-F. Cored Forgings Cut Production Costs. Miles J. Rowan. *American Machinist*, v. 95, Oct. 1951, p. 140-143.

Forgings cored without draft and accurate to ± 0.005 in. are now being produced regularly in brass and other nonferrous metals. Reductions in the weight of finished forgings run as high as 50% and subsequent machining is eliminated, or reduced to light finishing cuts. (F22, Cu, EG-a)

258-F. Nodular Iron Hot-Forged and Rolled Experimentally. J. A. Perry and J. E. Rehder. *Iron Age*, v. 168, Oct. 4, 1951, p. 229-233.

Tests show that higher rolling temperatures and increased reduction improve mechanical properties. Edge cracking was a problem, holding the yield on width to 80%. (F22, F23, Q general, CI)

259-F. Experiences With the Escher Metallic Recuperator on High-Temperature Furnaces. H. Escher. *Journal of the Iron and Steel Institute*, v. 169, Sept. 1951, p. 39-46.

Describes the above. Performance figures are given for a 10-in. mill billet-heating furnace, equipped with recuperators. Heating characteristics of coke-oven gas and blast-furnace gas as fuel for firing are compared. It is shown that thicker stock can be more satisfactorily heated in a single zone by using blast-furnace gas firing rather than coke-oven gas. A design is proposed for a single-zone blast-furnace-gas-fired furnace. (F21)

260-F. Forging Munition Shells. W. Trinks. *Mechanical Engineering*, v. 73, Oct. 1951, p. 803-808, 817.

A review of two reports prepared by ASME on forging of steel shells.

Steps required for making shell forgings from 75 to 240 mm.
(F22, T2, ST)

261-F. Experience Growing in Forming, Machining Titanium Alloys. James McElgin. *Steel,* v. 129, Oct. 1, 1951, p. 68-69, 94.
Forging, forming, drawing and machining of Ti. Recommended practices for annealing and stress relieving.
(F22, G general, J23, J1, Ti)

262-F. Precision Forging to ".010" Tolerance. J. W. Sheehan. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 74-76.
Techniques in design and operation in production of close-tolerance forgings. (F22)

263-F. Metals for the West; A Modernized Merchant Mill. Ralph G. Paul. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 84-86.
A merchant mill that produces a wide variety of sizes and shapes of hot-rolled products. (F23, ST)

264-F. Unique Process for Aluminum Tube Extrusion Developed by AiResearch. A. L. Marinke. *Western Metals,* v. 9, Sept. 1951, p. 27-29.
Production of tubes for use in heat exchangers. Steps in the extrusion process. (F26, Al)

265-F. Viewpoints on Design and Operation of City-Gas-Fired Die-Forging Furnaces. (In German.) Ernst Maase. *Gas-und Wasserfach,* v. 92, Aug. 15, 1951, p. 193-196.
Problems of design of continuous heating furnaces, from the standpoint of optimum efficiency, and the problem of scaling. (F22)

266-F. Non-Metallic Inclusions. F. Rapatz and M. Strobich. *Iron and Steel,* v. 24, Oct. 1951, p. 463-464.
Results of investigations indicate the nature and quantity of inclusions that a steel can tolerate without prejudice to its hot workability. No final conclusions are drawn.
(F general, D9, M28, ST)

267-F. Estimating Time Required for Forging Operations. M. H. Wiegandt. *Machinery* (American), v. 58, Oct. 1951, p. 188-191.
Estimating time calls for careful analysis of forging operation sequence and determination of the time required for each stage in any given forging job. The determination must be based on observation over a period of time, in order to arrive at an average figure. (F22)

268-F. Tensile Strength of Warm-Worked Austenitic Steel. *Metal Progress,* v. 60, Oct. 1951, p. 166, 168, 170. Condensed from "Effect of Warm-Working on an Austenitic Steel (G18B), " G. T. Harris and W. H. Bailey.
Previously abstracted from *Iron and Steel Institute,* "Symposium on High Temperature Steels and Alloys for Gas Turbines". See item 210-F, 1951. (F general, Q27, T25, SS)

269-F. An Examination of Modern Theories of Rolling in the Light of Rolling Mill Practice. (Continued). N. H. Polakowski. *Sheet Metal Industries,* v. 28, Oct. 1951, p. 885-898.
Analyzes the spreading during rolling, the resistance of metals to deformation and gives a distinction between the yield stress curve and the curve of minimum resistance to compression. Graphs. (To be continued). (F23, Q24)

270-F. The Production of Non-Ferrous Sheet and Strip at the Works of J. F. Ratcliff, (Metals) Ltd. *Sheet Metal Industries,* v. 28, Oct. 1951, p. 901-903.
Operations include annealing, rolling, casting, and finishing.
(F23, J23, EG-a)

271-F. Faster Mill Speeds Increase Rolling Capacity. Dan Reebel. *Steel,* v. 129, Oct. 15, 1951, p. 88, 91-92, 94, 96, 98.
Rolling-mill delivery speeds have been increased from 25 to 40% during the last few years due mainly to use of new and improved motors and controls. Graphs and diagrams show new and old set-ups and comparative performances. (F23)

272-F. The Oldsmobile Forge Plant; A Study of Modern High-Production Forging. Part I. John C. McComb. *Steel Processing,* v. 37, Sept. 1951, p. 439-451, 467.
An introductory section plus sections on the hammer shop, the press and upset shop, heating for forging, die sinking, and quality control. (To be continued.) (F22)

273-F. Preformed Billets Aid Forgings Production. *Steel Processing,* v. 37, Sept. 1951, p. 452-453, 467.
How die-rolling crankshaft blanks cut number of operations in production of Pontiac crankshafts at Oldsmobile Forge Plant. The die-rolling process is a roll-die forging method which embodies the hot rolling technique. Unlike ordinary hot rolling methods where multiple passes are employed to reduce a billet to the desired section, die-rolling is limited to one stand and pass. (F22, ST)

G

SECONDARY MECHANICAL WORKING

326-G. Bending and Coiling Tubes of Nickel and High-Nickel Alloy. *Heating and Ventilating,* v. 48, Sept. 1951, p. 78-80.
Various techniques and equipment.
(G6, Ni)

327-G. "Koldflo": Cold Extrusion Tamed. *Iron Age,* v. 168, Sept. 20, 1951, p. 74.
Cold extrusion of steel with Mullins Mfg. Corp.'s Koldflo process. Weight and size tolerances can be kept within limits needed for most mass-produced precision parts, and because of the glass-smooth surface possible, machining can be kept at a minimum. (G5, ST).

328-G. Steam Treatment Increases High-Speed Tool Life. Herbert Chase. *Iron Age,* v. 168, Sept. 20, 1951, p. 126-128.
A process developed by International Business Machines. Steam, in a furnace at 1025° F, produces a tightly adherent, hard oxide on cutters, drills, hobs and other tools that avoids or delays the loading causing premature dullness. Pieces per grind have been increased from 45 to over 200%. Down-time for regrinding was substantially reduced. (G17, L14, TS)

329-G. Magnesium Impact Extruded. T. L. Patton. *Iron Age,* v. 168, Sept. 27, 1951, p. 81-85.
How Mg can be impact extruded in round, oblong, or rectangular shapes, with ribs, flanges, or bosses. Slugs were made from bar, powder, and hot metal. (G5, Mg)

330-G. Honing Hardened Gears Simplifies Production. W. G. Patton. *Iron Age.* v. 168, Sept. 27, 1951, p. 92-93.
To produce necessary accuracy in the internal spline on its high production sliding gears, Warner Gear Div. of Borg-Warner Corp., is finish honing the hardened gears. Adoption of honing has made it possible to eliminate the hard broaching operation, which required that hardness in the spline hole should not exceed Rockwell C-35. (G19)

331-G. Stretch-Forming on a Press Brake. Gilbert C. Close. *Machinery,* (American), v. 58, Sept. 1951, p. 153-155.
A modified 400-ton hydraulic press brake is being used in the shops at Northrop Aircraft, Inc., Hawthorne, Calif., for precision stretch-forming of aluminum skin sections for high-performance military airplanes.
(G9, Al)

332-G. Expanded Metals Save Weight and Material. Philip O'Keefe. *Materials & Methods,* v. 34, Sept. 1951, p. 74-77.
Available materials, design characteristics, fabrication, and applications. Fabrication procedures used include shearing, torch cutting, punching, drilling, forming, and arc welding. (G general, K1, T general)

333-G. Hard, Brittle Materials Machined Using Ultrasonic Vibrations. S. G. Kelley. *Materials & Methods,* v. 34, Sept. 1951, p. 92-94.
New process, employing abrasive particles and ultrasonic vibrations, efficiently shapes complicated forms in difficult-to-machine materials.
(G17)

334-G. Fabricating Magnesium Alloys. H. W. Perry. *Metal Industry,* v. 79, Sept. 7, 1951, p. 195-199.
Drawing, stretch forming, spinning, joining, and surface finishing. (G4, G9, G13, K general, L general, Mg)

335-G. Fundamentals of the Working of Metals. Part XXVI. Follow-Die Fabricating. George Sachs. *Modern Industrial Press,* v. 13, Sept. 1951, p. 24-26, 34.
Various gang-die methods with emphasis on the follow-die method. Equipment and techniques. (G1)

336-G. Machining Method for Carbides. *Precision Metal Molding,* v. 9, Sept. 1951, p. 67-69, 91.
A means of cutting holes of regular or irregular contour in hard materials such as cemented carbide is called Cavitron and involves the use of ultrasonics. Using a blunt tool of the desired shape, a hole can be cut in any material. (G17, C-n)

337-G. Jet Plane Production Spurs Unique Machines and Methods. Norman Lynn. *Steel,* v. 129, Sept. 24, 1951, p. 98-100.
Pilot lines at Lockheed use radically new types of machines designed to "carve" wing sections from solid metal and to produce many other intricate parts by template-guided tools. (G17)

338-G. Press Clips Produce Wrinkle-Free Stampings. R. B. Stanton. *Steel,* v. 129, Sept. 24, 1951, p. 101-102.
Apparatus and procedure developed by North American Aviation at Los Angeles which make it possible to produce stampings without wrinkle defects. (G3)

339-G. Effects of Light Peening on the Yielding of Steel. N. H. Polakowski. *Welding Journal,* v. 30, Sept. 1951, p. 450s.
Discusses paper by H. L. Harrison and B. D. Mills, Jr. (May 1951, issue; see item 186-G, 1951.)
(G23, Q23, ST)

340-G. Now You Can Machine "Green" Carbide Compacts. Henry Swenson. *American Machinist,* v. 95, Oct. 1, 1951, p. 131-133.
Production of carbide cutters with a minimum of labor. Carbide was used for the cutting head only and this was brazed to a high speed steel shank. (G17, C-n, TS)

341-G. Spotwelder Doubles as Hot Upsetter. William E. Finney. *American Machinist,* v. 95, Oct. 1, 1951, p. 134-135.
How hot-upsetting operations on the heel sections of fabricated steel shoes for Wagner automotive and truck hydraulic brakes are per-

formed in National 150-kva. special spot welders with automatic heat and hydraulic ram pressure.
(G1, K3, ST)

342-G. U. S. Air Force Machinability Report 1951. *American Machinist,* v. 95, Oct. 1951, p. 161-168.
A review of the second section of a report issued by Curtiss-Wright Corp. on the machining of a wide variety of steels. A flow chart summarizing data in the U. S. Air Force Machinability Report, 1951. Tool life curves show similar structures of 12 steels. (G17, ST, TS)

343-G. Machinability of Titanium 150A. *American Machinist,* v. 95, Oct. 1951, p. 179. (From "U. S. Air Force Machinability Report," Curtiss-Wright Corp., 1951.)
Data in graphical form on carbide tool life. (G17, Ti, C-n)

344-G. Production Rate Chart for AISI 8640. *American Machinist,* v. 95, Oct. 1951, p. 181, 183.
Chart shows the effects of feed and speed on tool life. An alignment chart with directions on its use is also given. (G17, AY)

345-G. Improvement in Production of Multiple Parts by Oxyacetylene Cutting Techniques. Harry S. Swan. *Industry & Welding,* v. 24, Oct. 1951, p. 38, 40-41, 112.
Preparation of parts which will be used for arc-welded fabrication was shown to be most economically accomplished by oxy-acetylene cutting.
(G22, ST)

346-G. An Important New Method for Metal Gouging and Cutting. Metal Removal by Carbon Arc. *Industry & Welding,* v. 24, Oct. 1951, p. 60-62, 65-66, 111.
A device, which, combining use of compressed air, ordinary carbon electrodes and a d.c. welding machine, rapidly and accurately removes defective welds, prepares welding grooves and cuts all ferrous and nonferrous metals. (G22)

347-G. Colloidal Graphite Serves as Lubricant in Hot and Cold Forming of Metal. Alden Crankshaw. *Materials and Methods,* v. 34, Oct. 1951, p. 180, 182-183.
Applications and data on how lubrication with colloidal graphite increases cutting tool life. (G21)

348-G. Thermal Distortion, Deflection and Vibration in Machine Tools. Part I. Max Kronenberg. *Modern Machine Shop,* v. 24, Oct. 1951, p. 178-182, 184, 186, 188, 190, 192, 194, 196.
The above three factors affect tool life, surface finish, working accuracy and maintenance of machines. Specific examples with notes on efficient means to reduce these factors.
(G17)

349-G. Careful Analysis Can Lower Your Cutoff Costs. H. J. Chamberland. *Steel,* v. 129, Oct. 1, 1951, p. 70-72.
Compares sawband and abrasive-wheel cutting techniques. Both have definite advantages and limitations which must be considered when selecting the most economical and practical method for a plant.
(G17, G18)

350-G. Manufacture of Wing Tip Fuel Tanks at Rohr Requires Unusual Forming and Welding Methods. George R. Brolaski. *Western Metals,* v. 9, Sept. 1951, p. 40-41.
Stretch forming, spot welding, heli-arc welding, and final assembly.
(G9, K1, K3, Al)

351-G. Processing Magnesium Alloys. H. W. Perry. *Aircraft Production,* v. 13, Oct. 1951, p. 313-316.
Previously abstracted from *Metal Industry.* See item 334-G, 1951.
(G4, G9, G13, K general, L general, Mg)

352-G. Fabrication at Maytag. Robert Beane. *Finish,* v. 8, Oct. 1951, p. 21-25, 67.
Equipment and procedures used to produce automatic washing machines. Included are slitting, deep drawing, punching, trimming, stamping, machining, and welding (spot, projection, seam and flash butt).
(G general, K3, CN)

353-G. New Air Force Machinability Research Report Issued. *Iron Age,* v. 168, Oct. 11, 1951, p. 110-114.
Reviews 2nd volume of "U. S. Air Force Machinability Report—1951," published by Curtiss-Wright Corp. Expands the microstructure-machinability correlation developed in the first report. Cutting speed vs. tool life charts are given for different microstructures of 12 commonly used steels. Latest information on machining Ti and its alloys, plus selected tabular and graphical data and photomicrographs.
(G17, M27, TS, Ti)

354-G. How to Bandsaw Bronzes. H. J. Chamberland. *Iron Age,* v. 168, Oct. 18, 1951, p. 110-112.
Until recent years, bandsawing of bronzes was limited to low speeds, and tool life was poor. New blades, machines, and techniques have improved this situation. The skip-tooth sawband and line grinding with carbide bands are of particular importance in handling Al and Mn bronzes. (G17, Cu)

355-G. Some Problems Encountered in the Use of Soluble Oils. A. W. Lindert. *Lubrication Engineering,* v. 7, Oct. 1951, p. 223-227.
"Soluble" or "emulsifiable" oils are used in many metalworking processes, especially grinding, as coolants, to avoid localized burning, and to prevent undesirable changes in surface properties. However, bluish-black spots frequently develop. This phenomenon was studied and a mechanism postulated to explain it. (G21, ST)

356-G. Forming and Fabricating Seamless Nickel Tubing. *Machinery* (American), v. 57, Aug. 1951, p. 163-168.
Methods recommended by the International Nickel Co. for coiling, bending, threading, expanding, welding, and brazing Ni, and high-Ni alloy, seamless tubing.
(G general, K general, Ni)

357-G. How Microstructure of Steel Affects Machinability. *Machinery* (American) v. 58, Oct. 1951, p. 177-179. (A condensation).
The Air Materiel Command of the U. S. Air Force is sponsoring an extensive investigation into the machinability of various metals, headed by Curtiss-Wright Corp. Seven microstructures typical of 12 commonly used steels are shown in a chart, together with curves indicating the tool life that can be expected in machining each type at given cutting speeds. (G17, M27, ST)

358-G. Drilling Cast Iron at 260 Feet per Minute With Carbide Tools. *Machinery* (American), v. 58, Oct. 1951, p. 184-187.
Cast-iron water-pump housings are drilled, reamed, bored, recessed, counterbored, and tapped at the rate of 430 per hr. on automatic, 8-station indexing machines at the Ford Motor Co. The results were accomplished by using carbide tools.
(G17, CI)

359-G. Drawing Limits for Rectangular Boxes. Toshisade Ishikawa. *Metal Progress,* v. 60, Oct. 1951, p. 80-82.
Information on limits for cupping rectangular sheets — an operation commonly encountered in production. Confined to a study of the geometric variables involved in drawing rectangular boxes of normal deep-drawing-grade Al sheet. Such variables as metal properties, heat treatment, hold-down pressures, press speed, and lubricant were held constant. (G4, Al)

360-G. Oxygen Cutting. *Metal Progress,* v. 60, Oct. 1951, p. 206, 208, 210. (Translated and condensed from "New Data on the Oxygen Cutting of Steel," F. Pfleiderer, *Journal de la Soudure,* v. 38, 1948, p. 151-160.)
Purpose of the research was to secure a more exact understanding of the nature of oxygen cutting and to understand the origin of drag lines in the hope of improving the smoothness of oxygen-cut surfaces. High speed motion-picture photography was used in the study. (G22)

361-G. Transparent Cutting Oils. J. C. Van Gundy. *Screw Machine Engineering,* v. 12, Oct. 1951, p. 57-61.
Performance data on active-type sulfurized oils. Properties of corrosive and non-corrosive types. Applications. (G21)

362-G. The Deep Drawing and Pressing of Non-Ferrous Metals and Alloys. (Concluded). J. Dudley Jevons. *Sheet Metal Industries,* v. 28, Sept. 1951, p. 815-823, 830; Oct. 1951, p. 915-924, 930.
The inter-stage annealing of deep drawn or pressed parts. Factors causing unsatisfactory annealing. Various tests which yield information concerning deep drawing and pressing properties. Reviews such matters as season cracking, stretcher strain markings, and the behavior of some nonferrous metals under the press. 46 ref.
(G1, G4, J23, EG-a)

363-G. The Fabrication and Welding of Austenitic Stainless Steels. P. L. Pocock. *Sheet Metal Industries,* v. 28, Oct. 1951, p. 933-942, 944.
(G general, K general, SS)

364-G. Ground Surfaces of High Speed Steel Cutting Tools. Vincent O. Stromberg. *Tool Engineer,* v. 27, Oct. 1951, p. 33-35.
How to detect softening and how to minimize its effects by careful grinding techniques so as to increase tool life. (G18, TS)

365-G. Experimental Measurement of Cutting Forces and Speeds. Part I. J. B. Armitage and A. O. Schmidt. *Tool Engineer,* v. 27, Oct. 1951, p. 36-40.
A summary of power and force measurements in metal-cutting experiments conducted and reported within the last 50 yrs. in various countries. Results are presented as much as possible in the same terms and units of measurement. Diagrams represent the various findings and theories of many experimenters. (To be continued.) (G17)

H

POWDER METALLURGY

90-H. Close Weight Tolerance on Truck Governor Weights Made by Powder Metallurgy. R. R. Abbott. *Precision Metal Molding,* v. 9, Sept. 1951, p. 38-39, 93-94.
Changes in section, combined with odd angles, and with no uniform dimensions in the direction of applied pressure during forming, all combine to make these governor weights unique. (H general, Cu)

91-H. Structural Parts by Powder Metallurgy: a Report of Available Metals and Their Characteristics. Philip R. Kalischer. *Precision Metal Molding,* v. 9, Sept. 1951, p. 45-47, 80-83.
Surveys data on copper-impregnated iron parts, pure-iron compacts, plain-carbon steels, alloy steels.

stainless steels, and brasses and bronzes.
(H general, Fe, CN, AY, SS, Cu)

92-H. Sintering of Porous Bronze Compacts. E. J. Williams. *Australasian Engineer,* Aug. 7, 1951, p. 79-83.
An alloy of 90 parts Sn, 10 parts Cu and 2 parts graphite was prepared from the corresponding powders by cold pressing into cylindrical compacts. Sintering was carried out with varying times and temperatures in an atmosphere produced by powdered charcoal. Variations of sintering temperature were found to produce greater changes in properties and structure than variations of sintering time. The heating rate was observed to have an appreciable effect on the dimensions and density of the sintered part. 14 ref.
(H15, Cu)

93-H. Production of Ductile Vanadium by Calcium Reduction of Vanadium Trioxide. E. D. Gregory and W. C. Lillendahl, and D. M. Wroughton. *Journal of the Electrochemical Society,* v. 98, Oct. 1951, p. 395-399.
A process for the production of high-purity V powder by the reduction of V_2O_3 with Ca and the forming, treating, and mechanical working of V compacts. Soft, ductile V rod, wire, and sheet were produced following powder metallurgy practice. 12 ref. (H general, V)

94-H. Production of Powdered Uranium and Thorium. P. Chiotti and B. A. Rogers. *Metal Progress,* v. 60, Sept. 1951, p. 60-65.
Method used at Ames Laboratory, for Atomic Energy Commission. The processes involve two stages: production of the metal hydrides, and their decomposition to powder.
(H10, U, Th)

95-H. Sintering Copper-Tin Powders. (In Portuguese.) Vicente Chiaverini. *Boletim da Associacao Brasileira de Metais,* v. 7, Apr. 1951, p. 133-160.
Behavior of Cu-Sn powders during sintering as well as under the influence of graphite and calcium stearate was studied. (H15, Cu, Sn)

96-H. Powder-Metal Parts; Their Physical Characteristics and Design Advantages. George H. Logan. *Machine Design,* v. 23, Oct. 1951, p. 133-136.
An illustrated survey. Production methods, comparative mechanical properties of sintered and heat treated powdered metal parts of steel, iron, brass, and bronze.
(H general, Q general, ST, Fe, Cu)

97-H. High Permeability "Sendust" Powder Ring Cores. E. G. Thurlby. *Metal Progress,* v. 60, Oct. 1951, p. 83-87.
"Sendust" is a high-permeability alloy discovered by Honda, Masumoto, and Yamamoto during investigation of the magnetic properties of the Fe-rich Fe-Si-Al alloys. Preliminary investigation was made to establish a manufacturing technique for Sendust powder cores, having a permeability of 80-90 coupled with acceptable loss factors, for use in loading coils for voice frequencies and transmission-network applications generally. Melting, crushing, ball milling, annealing, binding-agents, pressing, and baking methods used in Japan and also those used by the author.
(H general, P16, SG-n, p)

98-H. What About Metal-Powder Parts? *Product Engineering,* v. 22, Oct. 1951, p. 142.
Advantages of powder metallurgy process. Brass, Cu, bronze, Zn, and Fe powders are included.
(H general, Cu, Zn, Fe)

J

HEAT TREATMENT

244-J. Pulverized Fuel Furnaces for Annealing Malleable Cast Iron. H. W. Perrott. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Aug. 1951, p. 40-51; disc., p. 51-53.
In the ring-main method of distributing fuel only one feeder and fan are used with individual valves at each oven. Illustrates the use of pulverized-fuel firing in conjunction with various types of annealing furnaces, both side-fired and end-fired, and end-fired and topside-fired bogie-type ovens. Also the continuous bogie-type malleable annealing furnace. Includes operating data.
(J23, B18, CI)

245-J. The Gaseous Annealing Process. K. Roesch. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Aug. 1951, p. 55-57; disc., p. 57.
Gaseous annealing furnace heated by means of radiant tubes installed at the German works of Bergische Stahl-Industrie. Comparative heat treatment curves for three types of gaseous annealing furnaces and an ore-annealing furnace. Comparative figures for monthly output, power consumption, consumption of boxes and ore, and capital costs are given for gaseous annealing furnaces and a pit furnace for annealing ore.
(J23)

246-J. Annealing Blackheart Malleable Cast Iron in a Controlled Atmosphere Furnace. E. Hunter. *British*

Cast Iron Research Association Journal of Research and Development, v. 4, Aug. 1951, p. 59-64; disc., p. 64-66.

Radiant-tube bell-type furnaces are fired by producer gas generated in gas producers operating on anthracite fuel. The data refer chiefly to 25-ton furnaces, but some reference is made to 5-ton furnaces. (J23, J2, CI)

247-J. Heating and Cooling in Steel Treatment. F. Lomas. *British Steelmaker,* v. 17, Sept. 1951, p. 475-478.

The structural transformations which take place on heating and cooling and the characteristics obtained in accordance with varying temperature changes and the mass of the piece involved. (J2, ST)

248-J. Control of Annealing Temperatures of Copper Alloys to Meet Close Specifications. Joseph Albin. *Industrial Heating,* v. 18, Sept. 1951, p. 1548-1550, 1552, 1554, 1556, 1558, 1560.

Techniques used by the American Brass Co. (J23, Cu)

249-J. Laminated Springs. *Iron and Steel,* v. 24, Sept. 1951, p. 443-445.

Mechanized production of railway springs is now being carried out at English Steel Corp.'s Grimesthrope works. Two furnaces are provided, one for heating the spring packs prior to forming and quenching, the other for tempering. (J26, J29, T7, ST)

250-J. The Hardening and Tempering of Steel—Conventional and Hot Oil Quenching. *Lubrication,* v. 37, Sept. 1951, p. 97-112.

Current quenching and tempering practice is reviewed. Hot-oil quenching is discussed in detail to clarify its present and potential commercial applications. (J2, ST)

251-J. Spheroidizing. J. Lomas. *Machinery Lloyd* (Overseas Ed.), v. 23, Sept. 1, 1951, p. 73, 75, 77-79.

A treatment which enables high-carbon steels to be obtained in the form of cementite balled-up (or spheroidized) in a matrix ferrite. This structure can be much more readily machined. (J23, CN)

252-J. Heat Treating Equipment Integrated in Single Unit. *Steel,* v. 129, Sept. 24, 1951, p. 110.

Complete, controlled system of heat treating—the Contro-Therm process developed by A. D. Alpine, Inc., Culver City, Calif.—uses a heat treating furnace, a loader, and a quench tank, all in one small unit. (J26)

253-J. Effect of Cooling Rate on the Aging of Structural Steels. C. R. Felmley, C. E. Hartbower, and W. S. Pellini. *Welding Journal,* v. 30, Sept. 1951, p. 451s-458s.

Quench and strain-aging characteristics of structural steels were shown to be dependent on rate of cooling from 1200° F. The steels investigated included rimmed, Si-killed, Al-killed, and V-Ti-killed types. Development of aging effects in near-weld zones as a result of mass quenching was demonstrated by strain-aging tests of near-weld zones for welds representative of various cooling rates. (J27, CN)

254-J. Continuous Production Assured With Batch Furnaces. George Brailsford. *American Machinist,* v. 95, Oct. 1951, p. 137-139.

Advantages of batch furnaces for armament manufacturers under present delivery conditions. Construction features and operation of hardening and drawing furnaces in production heat treat department of Douglas Mfg. Div. of Kingston Products Co. (J26, J29)

255-J. Heat Treatment—Inside Out. H. E. Linsley. *American Machinist,* v. 95, Oct. 1951, p. 144.

A way of stress-relieving large welded tanks when all welding must be done in the field. (J1, ST)

256-J. How Metallurgical Control Solves Shop Problems. T. A. Frischman. *American Machinist,* v. 95, Oct. 1951, p. 145-160.

Sources of problems in the heat treating shop; their effect on production; solutions for typical heat treating problems; preventive measures. (J general)

257-J. Heat Treatment Salts. A. L. Simmons. *Australasian Engineer,* Aug. 7, 1951, p. 44-56.

Classification and details of operating procedure for heat treatment salts in common use. Factors governing operation of salt baths. Properties of various salts. Treatment of high speed steels. 45 ref. (J2, TS)

258-J. Gaseous Nitriding. Allan Morgan. *Engineers' Digest,* v. 12, Sept. 1951, p. 290-292, 313. (Condensed.)

Previously abstracted from *Australasian Engineer.* See item 204-J, 1951. (J28, AY)

259-J. Rapid Tempering of High Speed Steel. A. E. Powers and J. F. Libsch. *Journal of Metals,* v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 865-871.

The early progress of reactions leading to secondary hardness in high speed steel, type 6-5-4-2 was studied to determine if induction tempering treatments of a few seconds duration are able to produce results equal to those of more conventional long-time tempering cycles. Temperature curves and summaries of heat treatments. 20 ref. (J29, TS)

260-J. The Significance of the Iron-Carbon Diagram in Heat Treatment. R. Whitfield. *Machinery* (London), v. 79, Sept. 13, 1951, p. 452-455.

Presents a diagram showing various alloy phases of iron and carbon, and steel up to 1.7% carbon. Treatments of these various phases are discussed. (J general, M24, Fe, ST)

261-J. Austempering. J. Lomal. *Machinery* (London), v. 79, Sept. 20, 1951, p. 503-505.

Limitations and modifications of the method. Applications to treatment of gray-iron castings as well as steel. (J26, ST, Fe)

262-J. Salt Baths for Metal Treating. Philip O'Keefe. *Materials & Methods,* v. 34, Oct. 1951, p. 115-130.

Selection of salts and equipment. Design and operating information on the following processes: Carbonizing and cyaniding, neutral hardening, high speed steel treatment, isothermal heat treatments, process annealing, tempering and coloring, heat treatment of Al, brazing, cleaning and descaling, and heating for forging and foaming. (J2)

263-J. Relief of Stress in Cast Iron. *Metal Progress,* v. 60, Sept. 1951, p. 134. (Condensed from "The Relief by Heat-Treatment of Externally Applied Stresses to Cast Iron," G. N. J. Gilbert.)

Previously abstracted from *British Cast Iron Research Association Journal of Research and Development.* See item 205-J, 1950. (J1, CI)

264-J. Sub-Zero Chilling as a Metallurgical Process. Rolland S. Jamison. *Modern Machine Shop,* v. 24, Oct. 1951, p. 140-144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 166, 168, 170, 172, 174, 176.

Applications in treatment of toolsteel, seasoning gages and tools and treating of metal and materials. Procedures for tempering and stabilization of metals. Examples of specific applications. (J2)

265-J. Hot Oil Quenching Expands Use of Carbon Steels. J. H. Greene. *Steel,* v. 129, Oct. 1, 1951, p. 64-67.

Compares hot quenching and conventional quenching. Advantages and disadvantages. Data on quenching media are tabulated. (J2, CN)

266-J. Application of Protective Gases in the Processing of Sheet Metal. (In German.) Robert v. Linde. *Gas- und Wasserfach,* v. 92, Aug. 15, 1951, p. 197-198.

Investigation of use of protective gases in heat treatment of steel and other metals showed that there are protective gases for all operations and that further great technical and economic advantages may be expected from their continued use. (J2, ST)

267-J. Heat Treatment of Metals. Part I. Carrol B. Mershon. *Industrial Heating,* v. 18, Sept. 1951, p. 1576-1578, 1580, 1582, 1584.

General principles of heat treating, the operations of heat treatment and the equipment used. Various furnace types and methods, including cooling, tempering, annealing, normalizing, spheroidizing, quenching and tempering, patenting, austempering, carburizing, nitriding, flame hardening, induction heating, and hydrogen and nitrogen furnace atmospheres. (To be continued.) (J general, CN)

268-J. Tool Steel Heat Treaters Can Profit from T-T-T Curves. L. H. Seabright. *Iron Age,* v. 168, Oct. 11, 1951, p. 101-105.

Time-temperature-transformation curves reveal much valuable information on how to heat treat tool and die steels. They show how to minimize distortion of water hardening and oil hardening steels; and the most practical way to cool high speed steels to satisfactorily transform austenite. (J26, N8, TS)

269-J. Heat Treating. Roger W. Bolz. *Machine Design,* v. 23, Oct. 1951, p. 98-107. (Based on Chapter 55 of the author's forthcoming book "Production Processes—Their Influence on Design", Penton Publishing Co., Cleveland, 1951.)

The various conditioning processes, softening treatments, and hardening treatments. Design considerations, selection of materials, and specification of tolerances. (J general)

270-J. Continuous Heat Treatment of Aluminum Alloy Strip. Marcel Lamourdedieu. *Metal Progress,* v. 60, Oct. 1951, p. 88-92. (Translated from the French).

Preliminary laboratory tests in France and conditions for commercial heat treating schedule. Test furnace was constructed in U. S.; its design and operation. Plans for erection of the furnace in France. (J27, Al)

271-J. Surface Hardening of Nodular Cast Iron With High-Frequency Currents. Takao Takase. *Metal Progress,* v. 60, Oct. 1951, p. 108.

Briefly outlines some experiments on the process. (J2, CI)

272-J. Gaseous Annealing of Black-Heart Malleable Iron. *Metal Progress,* v. 60, Oct. 1951, p. 226, 228. (Condensed from "Gaseous Annealing of Malleable Castings: The Present Position. Part II. Black-Heart Malleable," P. F. Hancock.)

Previously abstracted from *British Cast Iron Research Association Journal of Research and Development.* See item 156-J, 1951. (J23, CI)

273-J. Distortion of Tool Steels in Heat Treatment. J. Y. Riedel. *Metal Treating,* v. 2, July-Aug. 1951, p. 2-5; Sept.-Oct. 1951, p. 6-8.

Emphasis upon the nature of the toolsteel and the size and shape of the tools. (J26, TS)

274-J. The Surface Hardening of Steel. Part VIII. Nitriding. G. T. Colegate. *Metal Treatment and Drop Forging,* v. 18, Sept. 1951, p. 419-425.

The degree of dissociation and rate of flow of ammonia gas, time, and temperature as important factors in

nitriding process. Various methods used to prevent nitriding on certain surfaces of a treated part. (To be continued). (J28, ST)

275-J. The Use of the Salt Bath in Forging. Part II. Cyclic Annealing. *Steel Processing,* v. 37, Sept. 1951, p. 463-467.

General principles and practical procedures for annealing before forging. (J23, F22, ST)

K

JOINING

552-K. Instrumentation Minimizes the Welding Variable. J. Heuschkel. *Instruments,* v. 24, Sept. 1951, p. 1034-1041.

Previously abstracted from *Steel.* See item 450-K, 1951. (K3, K general)

553-K. Automatic Gas Soldering Gives Better, Cheaper Joints. *Iron Age,* v. 168, Sept. 20, 1951, p. 130.

A new soldering setup which gives an improved pipe-to-tank joint. Gas heat and electronic controls are used. (K7)

554-K. Welding in the Shipyard; Value and Application. E. Dacre Lacy. *Iron and Steel,* v. 24, Sept. 1951, p. 423-425.

Various applications of the different welding processes to ship construction. (K general, T22, ST)

555-K. Stud Welding the Aluminium-Magnesium Alloys. D. C. G. Lees. *Light Metals,* v. 14, Sept. 1951, p. 473-476.

Results of a series of tests. Present indications are that stud diameter should not exceed twice the plate thickness. (K1, Al, Mg)

556-K. Welding and Brazing Seamless Nickel Tubing. (Concluded). *Machinery* (American), v. 58, Sept. 1951, p. 156-159.

Methods recommended by the International Nickel Co. for joining Ni and high-Ni alloy seamless tubing by arc, oxy-acetylene, or inert-gas metal-arc welding; silver or copper brazing; or soft soldering. (K1, K2, K7, K8, Ni, Ag, Cu)

557-K. Reclaiming Tracta Joint Housings by Welding and Re-Machining. *Machinery* (London), v. 79, Sept. 6, 1951, p. 415-417.

Refers to universal-joint housings of armored tanks. Arc welding and machining are used. (K1, G17, CN)

558-K. High Quality Welds Obtained With Low Hydrogen Electrodes. Edwin Laird Cady. *Materials & Methods,* v. 34, Sept. 1951, p. 90-91.

Advantages, weld characteristics, and applications, as applied to steels. (K1, T5, ST)

559-K. Koldweld Progress. *Modern Metals,* v. 7, Sept. 1951, p. 55-56.

The Koldweld Process, which is claimed to produce strong, dense, dependable pressure welds with a minimum of difficulty. Some typical examples with particular reference to Al. (K5, Al)

560-K. Reclaiming Aluminum Diesel Locomotive Parts. La Motte Grover and R. L. Rex. *Railway Mechanical and Electrical Engineer,* v. 125, Sept. 1951, p. 56-59.

Use of inert-gas-shielded welding processes. (K1, Al)

561-K. All Welded Support For Multiple Platen Press. Otto E. Hermanns *Rubber Age,* v. 69, Sept. 1951, p. 707-712.

Advantages of a welded support compared to a similar riveted one. A detailed outline of cast analyses is also given. (K general, T5)

562-K. Aircraft Riveting. H. Giddings. *Sheet Metal Industries,* v. 28, Sept. 1951, p. 833-850.

From the standpoint of the structural designer. Functions of the riveted joint and various types of rivets in current use. Theoretical and test data on strengths, and fatigue and repeated loading characteristics. Rivet weights and riveting economics. (K13, Q general, ST, Al)

563-K. Seam Welding Containers Automatically. C. S. Seltzer. *Welding Journal,* v. 30, Sept. 1951, p. 791-800.

Details of design of an automatic body-welding unit for steel containers. (K3, CN)

564-K. Trends in Electronic Nonsynchronous Resistance Welding Controls. Stuart Rockafellow. *Welding Journal,* v. 30, Sept. 1951, p. 801-802. (K3)

565-K. The Application of Spot and Seam Welding to Design. S. P. Jenkins and T. P. Piper. *Welding Journal,* v. 30, Sept. 1951, p. 803-809.

The versatility and high-quality consistency of spot and seam welds obtained with present-day equipment and techniques as compared with that obtained from home-made resistance welding equipment of 20 years ago. Application of resistance welding to structural and nonstructural aircraft components, especially emphasizing spot welding. Urgent need for research and development programs to furnish engineers with suitable application design data for resistance welding. (K3)

566-K. High-Speed Consumable Electrode Machine Welding for Aircraft. Bernard Gross and Robert A. Smith. *Welding Journal,* v. 30, Sept. 1951, p. 812-816.

Techniques developed for satisfactory machine welding using an inert-gas shielded consumable electrode with speeds many times faster in aircraft application than those previously used. Macrographs show welds in various stainless steels and Al alloys. (K1, SS, Al)

567-K. The Arc Welding of Carbon-Molybdenum Steel Pipe. F. J. Winsor. *Welding Journal,* v. 30, Sept. 1951, p. 817-827.

Effects of preheating and stress relieving on properties of welds in C + 0.5% Mo steel pipe furnace tubing, and flange stock. For service temperatures above 800° F., preheating and stress relieving should not be required for welds made with cellulose-coated, Class E7010, electrodes in A206, A161, A234 and A182 C-Mo steels in thicknesses up to at least ¾ in. For welds made with Mn-Mo low-hydrogen electrodes, in the same range of thickness in these materials, preheating and stress relieving should not be required regardless of service temperature. The free-bend test, required by various codes for qualification of welding procedure, was found to be of questionable value as an indicator of the serviceability of welded joints. (K1, AY)

568-K. Welding Versus Waste. Alois Cibulka. *Welding Journal,* v. 30, Sept. 1951, p. 831-832.

Criticizes structural engineers for their slowness in adopting material-saving designs and procedures. Example shows how large amounts of steel can be saved by proper design and use of welding. (K general, CN)

569-K. Methods Improvement in Welding. S. Tilles. *Welding Journal,* v. 30, Sept. 1951, p. 832-833.

Check-list of question designed to aid in the above. (K general)

570-J. Flame Hardening Bulldozer Blades. *Welding Journal,* v. 30, Sept. 1951, p. 836.

Equipment and procedures of Seattle firm. (J2, ST)

571-K. Welded Tanks. *Welding Journal,* v. 30, Sept. 1951, p. 837-838.

Production by Baldwin-Lima-Hamilton Co. All welding is done by the electric-arc method. (K1, ST)

572-K. Largest Resistance Welder Installed at Ryan. *Welding Journal,* v. 30, Sept. 1951, p. 838-839.

Manufactured by the Federal Machine and Welding Co. of Warren, Ohio, to Ryan's specifications, the new machine can handle such heavy gages as two pieces of ⅛-in. thick Al alloy, or two pieces of 0.156-in. austenitic or Ni alloy, to an unusually great "throat" depth—60 in. (K3)

573-K. The Physical and Metallurgical Characteristics of Spot-Welded Titanium. M. L. Begeman, F. W. McBee, Jr., and J. C. Fontana. *Welding Journal,* v. 30, Sept. 1951, p. 429s-435s.

Properties and problems of spot welding commercially pure Ti. Optimum current timing and pressures; mechanical properties and microstructures of the welds. (K3, Ti)

574-K. Ice Flower-Like Structure in Metal Deposited by Arc Welding in Particular Mild Steel. Minoru Okada and Yoshikazu Wakabayashi. *Welding Journal,* v. 30, Sept. 1951, p. 469s, 472s.

Above structure is believed to be similar to micro-fissuring discussed in English welding literature. It is associated with and is found in close proximity to fisheyes when the latter appear in weld metal. From theoretical considerations, curves are drawn giving the relation of H_2 content of weld metal at 1800° K. for various ratios of CO/CO_2 and H_2O/H partial pressures and for various FeO contents at different temperatures. Experiments were made with small amounts of steel melted in an Al_2O_3 crucible and cast into a metal mold. Addition of 3% or more of iron oxide to the melt prevented formation of the ice-flower structure. Addition of a small amount of V also prevented it. (K9, M27, CN)

575-K. A Welded Exposition Building. M. Cosandey. *Welding Journal,* v. 30, Sept. 1951, p. 470s-471s. (Translated and condensed from *L'Ossature Metallique,* v. 16, 1951, p. 173-180; or *Bulletin Technique de la Suisse Romande,* No. 18, 1950.)

Arc welded steel and Al alloy structure at Lausanne, Switzerland. (K1, T25, Al, CN)

576-K. Semi-Automatic Welding Builds Tank Cars Faster. James S. Frey. *American Machinist,* v. 95, Oct. 1951, p. 170-171.

Construction of a 10,000-gal. aluminum tank, by gas-shielded arc welding. (K1, Al)

577-K. New Tools for Speed Welding. *Aviation Week,* v. 55, Oct. 8, 1951, p. 43, 45-46.

Giant resistance welding machines for handling large parts. A sequence timing panel was developed to cut "down time." (K3)

578-K. Why Shielded Arc Welding? H. E. Rockefeller. *Canadian Metals,* v. 14, Sept. 1951, p. 34-36, 38.

Applications of inert-gas-shielded-arc welding. A comparison is given between consumable and nonconsumable electrode methods of welding. (K1)

579-K. Measurement of Resistance of Welding Current. J. J. Ruley. *Industry & Welding,* v. 24, Oct. 1951, p. 48-50, 118-119.

Simple types of resistance-welding equipment, which contain control mechanisms. Applications. (K3)

580-K. Stored Energy for Stud Welding. *Industry & Welding,* v. 24, Oct. 1951, p. 68, 70, 72-73, 106-107.

A method of stud welding which eliminates need for flux, ceramic ferrules and special surface preparation and is easily adaptable to all types of metals and dissimilar metal combinations. (K1)

581-K. Welding Notebook. *Iron Age,* v. 168, Oct. 4, 1951, p. 234-235.
Practical welding ideas for the production and welding engineer.
(K general, G22, L24)

582-K. The *Iron Age* Chart of Comparable Arcwelding Electrodes. *Iron Age,* v. 168, Oct. 4, 1951, p. 245-248.
Tabular data cover information on electrodes of corrosion- resisting steel, copper, armor plate, mild steel, low alloy steel and aluminum.
(K3, T5, ST, Cu, AY, Al)

583-K. How to Braze-Weld Cast Iron. *Linde Tips and Oxy-Acetylene Tips,* v. 30, Oct. 1951, p. 77-80.
(K8, CI)

584-K. Brazed Assemblies for Cost Reduction. N. M. Salkover. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 110, 112, 114-115.
Previously abstracted from *Steel.* See item 506-K, 1951. (K7, K8)

585-K. How to Join Nickel and High-Nickel Alloys by Resistance Welding. Robert M. Wilson, Jr. *Materials & Methods,* v. 34, Oct. 1951, p. 95-99.
Previously abstracted from *Welding Journal.* See item 509-K, 1951. (K3, K8, Ni)

586-K. Assembly by Brazing. L. Jacobsmeyer. *Metal Industry,* v. 79, Sept. 14, 1951, p. 215-219; Sept. 21, 1951, p. 244-245.
Suitability of the process for a varied range of applications. Advantages of brazing brass to steel, brass to brass, brass to stainless steels and stainless to stainless, using silver alloys.
(K8, Cu, St, SS, Ag)

587-K. Joining Metals with Resin Adhesives. *Metal Progress,* v. 60, Sept. 1951, p. 128, 130. (Condensed from "The Bonding of Metals," C. J. Moss, *Metallurgia,* June 1951, p. 267-272.)
See abstract of "Bonding Rubber to Metal," *British Plastics;* item 134-K, 1951. (K11)

588-K. Simple Back-Up Device Facilitates Arc Welding of Box Sections. H. G. Frommer. *Modern Machine Shop,* v. 24, Oct. 1951, p. 234, 236, 238.
(K1)

589-K. Rivets That Need No Bucking. *Modern Plastics,* v. 29, Oct. 1951, p. 100-102.
Latest developments of plastic rivets. Achievement of a permanent fastening without the necessity of bucking the rivet is made possible by the fact that the rivet is automatically expanded from within when driven. They are injected molded in one piece from thermoplastic materials. They can be used to pin two or more sheets of metal, plastic or other materials. (K13)

590-K. Metallized Glass Components for TV. H. S. Craumer. *Television Engineering,* v. 2, Sept. 1951, p. 16-17, 23.
Metal-to-glass sealing techniques for bonding electrical conductors to excellent insulators such as glass permit a wide diversity of component designs. Production of such TV products as attenuator plates for microwaves, and ribbon capacitors and spiral inductances. (K11, T1)

591-K. Rolled Steel Machine Frames and Other Components Fabricated by Welding in Australia. John O. Ogden. *Welder,* v. 20, Jan.-June, 1951, p. 6-9.
Surveys and illustrations. Development of welding during the past decade. (K general, T26)

592-K. Welding of Copper and Its Alloys. (In French.) C. G. Keel. *Revue de la Soudure; Lastijdschrift,* v. 7, No. 2, 1951, p. 74-89.
Procedures and apparatus. Tables of alloy compositions suitable for welding, and samples of finished work. (K general, Cu)

593-K. Fatigue Strength of Welded Assemblies. Part II. (In French.) W. Soete and R. Van Crombrugge. *Revue de la Soudure; Lastijdschrift,* v. 7, No. 2, 1951, p. 90-97.
Rupture of welded structures (steel plates) with different weld designs were studied. Samples diagrammed and photographed. Data are tabulated and graphed. (K9, Q7)

594-K. Squeeze-Riveting. *Aircraft Production,* v. 13, Oct. 1951, p. 299-307.
Electro-hydraulic machine and equipment for fabrication of Bristol Type 175 wing-skin panels. (K13)

595-K. Automotive and Aircraft Sealers. *Automotive Industries,* v. 105, Oct. 1, 1951, p. 42-43, 108, 112, 114.
Applications of above materials to join metallic and nonmetallic components. (K12)

596-K. "Spot Cooling" Solves Tough Problem at 332 Welding Stations. Will D. Sampson. *Heating Piping & Air Conditioning,* v. 23, Oct. 1951, p. 100-101.
Air from a chemical dehumidifier is delivered through duct work to each of 332 welding stations in an industrial plant in the Gulf Coast area. The "spot cooling" thus provided has improved conditions and solved a number of problems.
(K general, A5)

597-K. Ultrasonic Soldering of Light Metals. A. E. Crawford. *Metallurgia,* v. 44, Sept. 1951, p. 113-116, 121.
The use of ultrasonics for the purpose of erosion of the oxide film on the surface of Al and its alloys was studied. The advantages and limitations of the method, and details of equipment available for its application. (K7, Al)

598-K. The British Welding Research Association. K. Winterton. *Metallurgia,* v. 44, Sept. 1951, p. 133-136.
Continued advances being made in the welding of various metals, and attention given to the engineering aspects of welded construction.
(K general, A9)

599-K. Joining Porous Metal Parts to Other Metals. H. W. Greenwood. *Metallurgia,* v. 44, Sept. 1951, p. 141-143.
The joining of porous metal parts made by powder metallurgy to similar parts and to nonporous metals, calls for the modification of accepted methods of joining. Methods used over a wide field, and conditions under which they have been found useful. (K general, H general)

600-K. Deep Welding—A New Method of Oxy-Acetylene Welding. R. Gunnert. *Metal Progress,* v. 60, Oct. 1951, p. 104-107.
Method is said to increase welding speed by 50% and lower the consumption of welding rod and gases. It introduces the flame deep into the gap, which is a butt joint, at right angles to its length. By this means the cone of the flame (and in particular its tip) is brought close to the root edges. Test welds were made on soft ST37 steel.
(K2, CN)

601-K. Welding Characteristics of Two Austenitic Steels Used for Gas-Turbine Rotors. *Metal Progress,* v. 60, Oct. 1951, p. 170, 172, 174, 176, 180, 182. (Condensed from "Weld-Metal Properties and Welding Characteristics of Two Austenitic Steels Used for Gas-Turbine Rotors," E. Bishop and W. H. Bailey.)
Previously abstracted from *Iron and Steel Institute,* "Symposium on High-Temperature Steels and Alloys for Gas Turbines." See item 488-K, 1951. (K9, AY)

602-K. Explosion Deformation Tests of Weldments. *Metal Progress,* v. 60, Oct. 1951, p. 212, 214, 216. (Condensed from "Explosion Bulge Test Studies of the Deformation of Weldments," C. E. Hartbower and W. S. Pellini.)
Previously abstracted from *Welding Journal.* See item 394-K, 1951.
(K9, ST)

603-K. A Review of Equipment Used in the Manufacture of Tin Boxes. (Continued). G. Taylor. *Sheet Metal Industries,* v. 28, Sept. 1951, p. 809-812; Oct. 1951, p. 907-908, 912.
The solder, flux, temperature, and setting factors to be considered in successful machine soldering. Design of body-making machines. Defects in such machines. (To be continued). (K7, Sn, CN)

604-K. Big Space Savings Realized in Brazed Aluminum Heat Exchangers. *Steel,* v. 129, Oct. 15, 1951, p. 80-82.
Production by Trane Co., La Crosse, Wis. Advantages.
(K8, T27, Al)

605-K. Fabricated Gears and Gear Cases. *Welding & Metal Fabrication,* v. 19, Sept. 1951, p. 330-334; Oct. 1951, p. 392-396.
Equipment and procedures employed for flame cutting, preforming, and gas and arc welding. Material fabricated includes bronze gear rims to steel and cast iron, also different types of alloy steels and stainless steels.
(K1, K2, G22, T7, Cu, Fe, AY, SS)

606-K. The Construction of Australia's Largest Water Pipeline. D. Cooke. *Welding & Metal Fabrication,* v. 19, Oct. 1951, p. 374-378.
Welding and other procedures used.
(K general, CN)

607-K. Metal Crate Production. *Welding & Metal Fabrication,* v. 19, Oct. 1951, p. 379-382.
Production of the above by a British firm. Gas welding is used to join the steel parts. (K2, CN)

608-K. The E. S. S. Welding Process. H. O. Willrich. *Welding & Metal Fabrication,* v. 19, Oct. 1951, p. 383-385.
Semi-automatic process developed by Siemens-Schuckert is a combination of the Elin-Hafergut and Unionmelt processes. (To be continued.)
(K1)

609-K. Resistance Welding Light Alloys. R. Bushell. *Welding & Metal Fabrication,* v. 19, Oct. 1951, p. 387-389, 396.
Recommended procedures and equipment. Information is concerned only with Al and its alloys. (K3, Al)

610-K. Stud Welding on Aluminium Alloys. D. C. G. Lees. *Welding & Metal Fabrication,* v. 19, Oct. 1951, p. 390-391.
Tests made on some Al-Mg alloys of particular interest in marine construction. (K1, Al)

611-K. Welding Equipment Maintenance. T. B. Jefferson. *Welding Engineer,* v. 36, Oct. 1951, p. 33.
Stresses the need for proper care of welding tools. (K general)

612-K. Preventive Maintenance for Resistance-Welding Equipment. *Welding Engineer,* v. 36, Oct. 1951, p. 38-41.
How checks at regular inspection periods will find weaknesses in resistance welders before they can lead to breakdowns. (K3)

613-K. How to Prevent Arc Welder Troubles. *Welding Engineer,* v. 36, Oct. 1951, p. 34-36.
How to set up a systematic maintenance program. Hints on service records, lubricating and proper inspection. (K1)

614-K. Welding at War. *Welding Engineer,* v. 36, Oct. 1951, p. 51-53.
Welding practices being carried on in Korea in the maintenance of military equipment. (K general, T2)

615-K. Inert-Gas-Shielded Metal-Arc Welding of Magnesium. Paul Klain. *Welding Journal*, v. 30, Oct. 1951, p. 887-893.

The experimental work was limited to the Mg alloy FS1 (3 Al, 1 Zn) and to the use of one type of commercially available manual welding equipment (Aircomatic, Model 3). Arc characteristics, mechanical properties, and soundness of welds obtained on Mg by the use of the metal-arc process were studied.
(K1, Mg)

616-K. A Case of Power. Jerry Geralds, Paul Duker, and Myron Zucker. *Welding Journal*, v. 30, Oct. 1951, p. 894-902.

Power-supply problems from the viewpoint of management. Shows the importance of machine setup and operating practices in selecting a power supply for welders; and how "thinking-before-doing" can produce an adequate system at moderate cost, under difficult conditions. (K1)

617-K. Aircomatic Welding of Austenitic Stainless Steels. W. G. Benz, Jr., and J. S. Sohn. *Welding Journal*, v. 30, Oct. 1951, p. 911-926.

Presents results of an investigation of the mechanical properties and resistance to corrosion of austenitic Cr-Ni grades of stainless steel weld metal and welded joints deposited with the inert-gas-shielded metal-arc process. 14 ref.
(K1, R general, Q general, SS)

618-K. Aircomatic Welding Refinery Components and Pressure Vessels. Stephen A. Yaczko. *Welding Journal*, v. 30, Oct. 1951, p. 903-907.

Procedures for welding stainless, stainless-clad steel, low-alloy steel, and Cu-alloy pressure vessels by the Aircomatic welding process.
(K1, SS, AY, Cu)

619-K. High-Temperature Welded Joints. R. H. English. *Welding Journal*, v. 30, Oct. 1951, p. 907-910.

Common types of high-alloy castings used for high-temperature work, and welding procedures (mainly shielded metal-arc process) for their fabrication. Types discussed are the HH (25 Cr, 12 Ni), the HK (25 Cr, 20 Ni), and the HT (15 Cr, 35 Ni). (K1, SS, SG-h)

620-K. Pressure Welding Aluminum at Various Temperatures. Mike A. Miller and Glenn W. Oyler. *Welding Journal*, v. 30, Oct. 1951, p. 486s-498s.

Major factors in pressure welding of Al are temperature, pressure, and time. Advantages and disadvantages of using low temperatures and high unit pressures, as contrasted to the use of elevated temperatures and low unit pressures. Applications for pressure welding of Al. (K2, Al)

621-K. Investigation of Factors Which Determine the Performance of Weldments. C. E. Hartbower and W. S. Pellini. *Welding Journal*, v. 30, Oct. 1951, p. 499s-511s.

The explosion bulge technique was applied to study of the fracture performance of ¾-in. thick butt weldments and unwelded plate. Two steel representatives of high-tensile and mild steel grades were investigated. The deformation characteristics of the various weld and base-metal combinations were studied together with their flow strengths and Charpy V-notch transitions in an attempt to determine the basic factors controlling weld performance.
(K9, Q26, ST)

622-K. Tensile Tests and Metallurgical Studies of Welded Copper Joints. R. J. Mosborg, R. W. Bohl, F. W. Howland, and W. H. Munse. *Welding Journal*, v. 30, Oct. 1951, p. 519s-528s.

Investigation at various temperatures and by different welding processes. (K general, Q27, Cu)

623-K. (Book) Das Schweissen im Schiffbau. (Welding in Ship Construction.) K. Krekeler. 43 pages. 1950. W. Girardet, Essen, Germany.

Reviews the present status and prospects of German ship construction. Advantages of welding over riveting; design and material of welded parts; welding methods for structural and machine parts, including steam turbines and diesel engines. 21 ref. (K general T22, ST)

L

CLEANING, COATING AND FINISHING

672-L. Spray Gun Bonderizing; A Pyrene Cold Pre-Treatment Process. *Automobile Engineer*, v. 41, Sept. 1951, p. 340.

An addition to the range of metal pretreatment and rustproofing processes marketed by Pyrene Company, Ltd., Middlesex, England. (L14, ST)

673-L. More About Protecting Your Steel. *Chemical Engineering*, v. 58, Sept. 1951, p. 167-170.

A review of a recent article. Novel approaches to the problem which emerged from the survey are elaborated on. (L general, ST)

674-L. Help Your Steel to Hold Its Protective Coating. A. J. Liebman. *Chemical Engineering*, v. 58, Sept. 1951, p. 326, 328, 330-331.

Various techniques in bonding of paint to metal to prevent corrosion.
(L14, L26, ST)

675-L. Paint Finishing of Steelcraft Building Products. *Industrial Heating*, v. 18, Sept. 1951, p. 1628-1630, 1634-1640.

Equipment and methods. (L26, ST)

676-L. Cans: A New Rival for Tinplate. Bill Packard. *Iron Age*, v. 168, Sept. 20, 1951, p. 72.

Two new processes developed by Reynolds Metal Co. One process uses heavy Al foil and plastic. The other welds a permanent bond of Al foil onto steel sheets. Either process would replace scarce tin.
(L22, L24, Al, ST)

677-L. Vitreous Enamelling; Use of Electric Furnaces for Firing. *Iron and Steel*, v. 24, Sept. 1951, p. 445-446.

The modern method of applying the heat required in the enameling. Operation and maintenance of the electric furnaces. (L27)

678-L. Sulphuric-Acid Anodizing. *Light Metals*, v. 14, Sept. 1951, p. 526-528. (Based on paper by V. F. Henley.)

Conditions for the production of successful films. Suitability of these films for subsequent dyeing processes. (L19, Al)

679-L. Electrostatic Atomization of Paint Reduced Cost of Metal Finishing. *Machinery*, (American), v. 58, Sept. 1951, p. 185-186.

How paint is atomized into a fine spray of electrically charged particles, which are instantly drawn to metal parts carried along a conveyor line in a process recently developed by the Ransburg Electro-Coating Corp., Indianapolis, Ind.
(L26)

680-L. Sinclair Evaluates Neoprene Coatings for Tanker Fleet. W. N. Damonte and T. T. Wilkinson. *Marine Engineering and Shipping Review*, v. 56, Oct. 1951, p. 40-47.

Trial applications of neoprene on sea valves, circulators, heat-exchanger heads, and other equipment similarly exposed to sea-water corrosion. Schematic diagram of the testing.
(L26, R4)

681-L. Rare Earths in Aluminum Baths Give Attractive Hot-Dip Coatings. Webster Hodge and E. M. Smith. *Materials & Methods*, v. 34, Sept. 1951, p. 95-96.

Experimental work shows that addition of rare-earth alloying metals to hot-dip Al baths gives smooth coatings on mild-steel parts without use of a flux. (L16, Al, EG-g)

682-L. The Production of Colored Gold Finishes. Edmund R. Thews. *Metal Finishing*, v. 49, Sept. 1951, p. 80-85.

Methods for production are by alloy gold plating, deposition of light, translucent gold films, alloying with the undercoat by diffusion, or etching treatment. Factors affecting deposits. (L17, L15, Au)

683-L. Electrodeposition in Marine Engineering. I and II. R. E. Wilson. Metal Industry, v. 79, Aug. 31, 1951, p. 171-174; Sept. 14, 1951, p. 221-223.

Use of electrodeposition for providing considerable thicknesses of wear resisting metals on various parts and equipment used in marine engineering, largely for salvage of worn components. (L17, T22)

684-L. A Prosperous Metal Finishing Firm. *Modern Metals*, v. 7, Sept. 1951, p. 47-50.

Operations of the Chicago Thrift-Etching Corp., which is equipped for anodizing, plating, etching, polishing, or enameling a complete range of metals. Methods of manufacture of the Alumilite processed aluminum identification plate which was originated by this company.
(L general)

685-L. Factors Affecting the Testing of Automotive Finishes. Ralph J. Wirshing and Wardley D. McMaster. *Paint and Varnish Production*, v. 41, Sept. 1951, p. 13-18, 32.

Data on adhesion tests and others.
(L26)

686-L. Color Effects in Electrographic Printing. Max Kronstein. *Paint and Varnish Production*, v. 41, Sept. 1951, p. 19-21, 36.

Development of the above as it can be utilized as a test method for paint on metals. A new approach to the study of corrosion. Tests were made of coatings over base and phosphate-treated steels.
(L26, R11, ST, Al)

687-L. Refractory Coatings on Mild Steel. *Sheet Metal Industries*, v. 28, Sept. 1951, p. 865.

A finishing process called "Stone-clad" gives mild steel protection up to 800° C. Applications. (L27, CN)

688-L. Plug Welding Technique in Clad Lining Dough Mixer Bowls. W. M. Davis. *Welding Journal*, v. 30, Sept. 1951, p. 829-831.

Improved operations and a 30% direct labor saving are results of above technique developed for welding stainless steel clad sheet to heavy gray-iron castings used as end members on large mixing bowls, at J. H. Dry Co., Inc., Cincinnati, Ohio, makers of mixing equipment for bakery, chemical, paint, and allied fields.
(L22, SS)

689-L. Surface Preparation for Metallizing Shafts and Similar Objects. Peter G. Dennison. *Welding Journal*, v. 30, Sept. 1951, p. 835-836.

Method developed in 1938 and kept as a trade secret until recently by Metal Spraying Corp., Milwaukee. It involves threading and knurling prior to metal spraying. (L23)

690-L. VPI Wrap for Wire Protection. D. W. Light. *Wire and Wire Products*, v. 26, Sept. 1951, p. 759-761, 801-802.

Describes patented product and system of rust prevention developed

by Shell Development Co. VPI Wrap is a special neutral paper coated on one side with a synthetic organic chemical that has powerful corrosion-inhibiting qualities. The wrap is particularly valuable when packaging wire and other products and surfaces that are not easily reached by conventional contact inhibitors. (L26, R10)

691-L. The New Tin Nickel Alloy Electroplate. *Wire Industry,* v. 18, Sept. 1951, p. 794, 797. (Reprinted from "Tin and It's Uses," Tin Research Institute.)

A new plated finish is composed of 65% Sn and 35% Ni. It can be deposited directly on Cu and Cu-base alloys, but in the case of steel a Cu undercoat is recommended. (L17, Cu, ST, Sn)

692-L. Cleaning with Sodium Hydride. (In French.) *Métallurgie et la Construction Mécanique,* v. 83, Aug. 1951, p. 602-603.

Cleaning of steel ingots. Advantages of process and examples of application. (L12, ST)

693-L. Chromium Plated Aluminum. *Canadian Metals,* v. 14, Sept. 1951, p. 48.

Various plating methods and some applications. (L17, Al)

694-L. Hot Dip Galvanizing; American and British Methods Compared. *Chemical Age,* v. 65, Sept. 1951, p. 401-403.

Shop construction and equipment, dipping techniques, and treatment of residues. (L16, Zn, CN)

695-L. Contact Tin Plating With a Difference. J. K. Wilson and O. Wright. *Electroplating and Metal Finishing,* v. 4, Sept. 1951, p. 274-276.

Exceptionally dense and adherent tin coatings can be formed on most metals, including cast iron, many alloy steels, brass, and copper, by simple immersion in contact with Al in the hot stannate solution normally used for electroplating. Contact tinning may be of value as an undercoat, in the electroplating of cast iron, in the prevention of fretting corrosion of contacting surfaces, and for the protection of springs and of aircraft radiators and oil coolers. (L16, Fe, AY, Cu, Sn)

696-L. Modern Practice in Hot Dip Galvanizing. R. W. Bailey. *Electroplating and Metal Finishing,* v. 4, Sept. 1951, p. 277, 280.

The Sendzimir process in use by John Summers and Sons at Shotton, England. (L16, Zn, CN)

697-L. Vapor Deposition of Metals on Ceramic Particles. James E. Cline and John Wulff. *Journal of the Electrochemical Society,* v. 98, Oct. 1951, p. 385-387.

Coating of ceramic particles with metal by vapor deposition for the production of high-temperature metal-ceramic bodies. Methods for coating particles of ceramics such as SiO_2, SiC, and Al_2O_3 with Mo deposited by H_2 reduction of molybdenum pentachloride and with Ni deposited by decomposition of nickel carbonyl. (L25, Mo, Ni, Fe)

698-L. The Basic Types of Phosphate Coatings and Where to Use Them. Robert F. Ayres. *Materials & Methods,* v. 34, Oct. 1951, p. 100-103.

Includes a table of the types and applications of phosphate coatings. These coatings are applied to Fe steel, Zn, Cd, and Al by spraying, dipping, or painting. (L14)

699-L. Waxes Now Used to Process as Well as Protect Materials. Kenneth Rose. *Materials & Methods,* v. 34, Oct. 1951, p. 104-107.

Classifies waxes as animal, vegetable, mineral, and synthetic. The properties of waxes which are of industrial importance, the forms of waxes, and their application. Waxes used as protective films, ingredients in compounded materials, wetting agents, low-temperature fusing constituents, and lubricants for metal processing. (L26, F1)

700-L. Hot-Dip Galvanizing of Cold-Rolled Strip. H. Bablik, F. Gotzl, and R. Kukaczka. *Metal Industry,* v. 79, Sept. 21, 1951, p. 241-243.

Methods used and nature of the surface required for galvanizing. Test data are tabulated. (L16, CN, Zn)

701-L. Improving Bendix Airplane Landing Wheels by Burnishing. W. H. DuBois. *Metal Progress,* v. 60, Sept. 1951, p. 55-59.

Tests were made on full-scale models of relatively complicated aircraft wheels cast in Mg alloys. Compares ball peening, and burnishing or rubbing. Difficulties and techniques involved. Feasibility of using these treatments on production parts. (L10, Mg)

702-L. Quick Patina on Copper, Brass, or Nickel Alloys. William G. Schneider. *Metal Progress,* v. 60, Sept. 1951, p. 74-76.

Patina is a natural coloration which develops on these alloys after long periods of atmospheric exposure. It is desirable to have a method for rapidly producing an artificial patina so that repaired sections of roofs, etc., will have the same appearance as the older material. A chemical solution process is said to give satisfactory results. (L14, Cu, Ni)

703-L. Phosphate Coatings. Alfred Douty. *Plating,* v. 38, Oct. 1951, p. 1030-1033.

Compares phosphate coating and electroplated coatings. Types recommended for various metal surfaces. (L14, ST, Fe, Zn, Cd, Al)

704-L. Chromate Treatments. Charles W. Ostrander. *Plating,* v. 38, Oct. 1951, p. 1033-1035.

Characteristics of chromate solutions and coatings. Types of solutions and their applications. (L14)

705-L. Black Oxide Coatings on Metals. Walter R. Meyer. *Plating,* v. 38, Oct. 1951, p. 1036-1937.

Features of the coatings on iron, steel, copper, and aluminum. (L14, Fe, ST, Cu, Al)

706-L. Organic Coatings in Today's Metal Finishing. Donald R. Meserve. *Plating,* v. 38, Oct. 1951, p. 1037-1039.

A few of the ways in which organic coatings have been used to protect metal parts. (L26)

707-L. Porosity of Electrodeposited Metals. X. Hydrogen Content of Electrodeposited Metals. N. Thon, Denis G. Keleman, and Ling Yang. *Plating,* v. 38, Oct. 1951, p. 1055-1058.

Tests on steel, Cu, Cr, Ni, and Fe, which showed different forms of occlusion of H_2. Results show that H_2 can exist in a metal in at least three forms. (L17, Ni, ST, Fe, Cu, Cr)

708-L. A Modern Approach to a Production Problem. *Production, Engineering & Management,* v. 28, Oct. 1951, p. 79-81.

Recent strides take in the application of power brushing to deburring work have resulted in worthwhile savings on many high-volume operations. (L10)

709-L. Ceramics for the Hot Spots. James Blane. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 88-89, 100.

Application of ceramic materials in protecting steels at temperatures above 1900° F. (L27, ST)

710-L. Descaling Hot Rolled Steel Strip, Bars and Rods. R. O. Peterson. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 103.

A mechanical brushing method that not only removes scale but also improves the surface and the physical characteristics of the article in preparation for further processing. (L10, ST)

711-L. Electrolysis of Phosphoric Acid Between Copper Electrodes. Electrolytic Polishing. (In French.) Denise Laforgue-Kantzer. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Aug. 20, 1951, p. 547-550.

Solution of the anode takes place in two stages, while polishing occurs to the degree that a hydroxylated acid phosphate which constitutes the "viscous layer", exists in equilibrium with the oxide on the electrode surface and with the acid in solution. (L13, Cu)

712-L. Silicones. IV. Process of Producing High-Contrast Printed Characters on Electrolytically Oxidized Light-Metal Surfaces. (In German.) H. Reuther and R. Muller. *Chemische Technik,* v. 3, June, 1951, p. 177-178.

A new printing process in which the electrolytically thickened layer of Al_2O_3 is treated with reducing silico-organic substances and then printed with a reducible-metal-salt solution. (L26, Al)

713-L. Metallurgical Aspects of the Vitreous Enamelling of Cast Iron. (Conclusion.) A. L. Taylor. *Australasian Engineer,* July 7, 1951, p. 69-73.

Concludes literature review with sections on applications and firing and on enamel defects. 96 ref. (L27. CI)

714-L. A Look Into the Future of Enamel Furnace Design. E. W. Dany. *Finish,* v. 8, Oct. 1951, p. 32-35, 91.

Possible design of the continuous enameling furnace in 1971. Some advanced present types. (L27)

715-L. New Ceramic Coatings for Jet Engine Parts. Gilbert C. Close. *Finish,* v. 8, Oct. 1951, p. 27-29, 90-91.

"Solaramic" process developed by Solar Aircraft Co., San Diego, for applying a vitreous coating as thin as 0.0005 in. to alloy metals with resultant longer life and reduction in critical materials used. Material coated is stainless steel. (L27, SS)

716-L. The Production of Mirror Finish. F. Cattin. *Industrial Diamond Review,* new ser., v. 11, Sept. 1951, p. 194-198. (Translated from *Industrielle Organisation,* v. 19 (1), 1950, p. 10-12).

A new working method, completely mechanical, which produces extreme surface finish, and at the same time dimensional accuracy and can equally well be applied to cylindrical or tapered workpieces. (L10)

717-L. Good Plating Techniques Save Money, Cut Stream Pollution. *Iron Age,* v. 168, Oct. 18, 1951, p. 99-101.

Study by Ohio River Valley Sanitation Commission which shows that much valuable plating materials now wasted in streams can be salvaged and reused. (L17, A8)

718-L. The Pigment Vehicle Relationship in Anti-Corrosive Paints. J. E. O. Mayne, *Journal of the Oil & Colour Chemists' Association,* v. 34, Oct. 1951, p. 473-479; disc., p. 480.

The inhibition of corrosion of iron and steel by paints. The theory of corrosion is briefly reviewed together with certain general properties of unpigmented paint films. The pigments are divided into the following classes: inert, basic, and soluble. 21 ref. (L26, R10)

719-L. Vacuum Metallizing. Philip Rosenblatt. *Machine Design,* v. 23, Oct. 1951, p. 141-144, 180, 182.

The process, properties and applications of the coatings. (L23)

720-L. A New Finish for Magnesium Alloys. Harry A. Evangelides. *Metal Finishing,* v. 49, Oct. 1951, p. 56-60.

HAE coating recently developed

at Frankford Arsenal is produced by an electrolytic process and is ceramic and refractory in character. Corrosion-test results.
(L13, R general, Mg)

721-L. Practical Barrel Finishing. Parts I and II. Peter L. Veit. *Metal Finishing*, v. 49, Sept. 1951, p. 71-77, 88; Oct. 1951, p. 70-73.

Part I emphasizes the three main factors which give flexibility to barrel-finishing operations: type of medium, condition of the medium, and the barrel compound. Part II: some general aspects of barrel-finishing practices. The general treatment of metals, including the functions of cleaning and bright dipping. (To be continued.) (L10)

722-L. Calculating Metal Cost in Indium Plating. *Metal Finishing*, v. 49, Oct. 1951, p. 81.

Chart facilitates calculation.
(L17, In)

723-L. The "Onera" Bright Chromizing Process. Bernard Jousset. *Metal Progress*, v. 60, Oct. 1951, p. 76-77.

New process developed by a French organization whereby perfectly regular, smooth, and bright layers can be obtained in a single operation. These layers are highly resistant to corrosion caused by atmosphere, salt, nitric acid, and high temperature. No layers can peel or scale off from thermal or mechanical shock, because the surface layer is an integral part of the base metal. In the Onera process, gaseous chromium fluoride decomposes or "cracks" at the surface of the steel parts, the Cr diffuses into the metal, and the HF recombines with Cr chips, packed in with the steel articles. (L15, ST, Cr)

724-L. Properties of Electroplates. *Metal Progress*, v. 60, Oct. 1951, p. 182, 186, 188, 190. (Condensed from "The Physical and Engineering Properties of Electrodeposited Metals," J. S. Anderson.)

Previously abstracted from *Electroplating and Metal Finishing*. See item 8-307, 1949. (L17)

725-L. High Temperature Protection of Mild Steel by Refractory Facings. *Metallurgia*, v. 44, Sept. 1951, p. 144. (Condensed from Report No. 50/4/73 prepared by the Industrial Gas Development Committee of the Gas Council.)

Applications and test results are included. (L27, CN)

726-L. New Wet Blast Machine Designed Through Field Research. E. E. Brodhag. *Metal Treating*, v. 11, Sept.-Oct. 1951, p. 4-5.

Equipment designed by American Wheelabrator & Equipment Corp., Mishawaka, Ind., for removing heat treating scale from metal surfaces. Typical results are illustrated. (L10)

727-L. The Protection of Metallic Surfaces by Chromium Diffusion. Part II. Theoretical Considerations. R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging*, v. 18, Sept. 1951, p. 407-415.

Theoretical aspects of all processes, by which one metal is coated with another by chemical deposition from the gas phase at high temperatures, with particular reference to iron and steel. 13 ref. (To be continued.) (L15, Fe, CN)

728-L. A Versatile Production Finishing Plant. Jules Horelick. *Products Finishing*, v. 16, Oct. 1951, p. 14-20, 22.

Equipment and procedures of Allied Research Products, Inc., a job-plating plant in the Middle Atlantic area. Chemical coatings are also applied when desired. Details of some of the solutions employed. (L17)

729-L. Substitute Finishes Are Better Than You Think. *Product Engineering*, v. 22, Oct. 1951, p. 143.

Particular reference is made to a need for a substitution for the conventional Cu-Ni-Cr electroplate on steel. Typical substitute finishes are tabulated. (L17, ST, Cu, Ni, Cr)

730-L. Finishes for Aluminum Products. R. V. Vanden Berg. *Product Engineering*, v. 22, Oct. 1951, p. 179-186.

Electrochemical, organic, ceramic, mechanical, and chemical finishes for Al and Al alloys. (L general, Al)

731-L. Modern Hot-Dip Galvanizing. Raymond F. Ledford. *Products Finishing*, v. 16, Oct. 1951, p. 26-30, 32.

Principles and practical procedures. (L16, CN, Zn)

732-L. Hard Chrome Plating in Spain. F. R. Morral. *Products Finishing*, v. 16, Oct. 1951, p. 54, 56.
(L17, Cr, ST)

733-L. Spotlighting Finishing Progress. Advances in Mechanical Finishing Open Up New Possibilities. Allen G. Gray. *Products Finishing*, v. 16, Oct. 1951, p. 68, 70, 72, 74, 78, 80, 84, 86, 88, 90, 92, 94, 96, 98, 100.

Extensive illustrated survey.
(L10)

734-L. Present-Day Methods for Copper Plating Iron and Steel and for Nickel Plating Copper Alloys (Copper, Brass, Bronze). (In French and German.) Roger Zirilli. *Pro-Metal*, v. 4, Feb. 1951, p. 778-792.
(L17, Cu, Ni, Fe, ST)

735-L. A Student's Approach to the Theory and Practice of Vitreous Enamelling. J. H. Gray. *Sheet Metal Industries*, v. 28, Sept. 1951, p. 853-864.

Equipment and procedures. General principles of design and preparation of sheet iron for enameling. (To be continued.) (L27, Fe)

736-L. Surface Treatment and Finishing of Light Metals, Part 7. S. Wernick and R. Pinner. *Sheet Metal Industries*, v. 28, Oct. 1951, p. 947-954.

Discussed from the viewpoint of the effect of alloy composition, film properties, impurities and operating conditions. A comparison is made between sulfuric acid and chromic acid processes. Other processes are mentioned. 25 ref. (To be continued).
(L17, Al, Mg)

737-L. Modern Developments in the Effective Utilization of Organic Finishes. H. J. Testro. *Sheet Metal Industries*, v. 28, Oct. 1951, p. 955-960, 962.

Methods are classified and described. Covers dipping, flow-coating, roller-coating, tumbling, whirling, and silk screening. (L26)

738-L. Tough Coating Opens Way to New Uses of Porcelain Enamel. *Steel*, v. 129, Oct. 15, 1951, p. 84.

Ti-Loc process developed by Strong Mfg. Co., Sebring, Ohio, for application of shock resistant porcelain enamel coatings to nonpremium steel in a one-coat process. A white Ti cover coat is used. (L27, CN)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

275-M. Studies on Tellurium-Selenium Alloys. E. Grison. *Journal of Chemical Physics*, v. 19, Sept. 1951, p. 1109-1113.

Te and metallic Se were shown to give solid solutions in any concentration. Variation of the cell dimensions with composition departs only slightly from linearity. The presence of sharp lines in all the alloys suggests that these must be composed not of homogeneous chains but of composite chains, in which the homogeneous sequences must be fairly short. (M26, Ti, Se)

276-M. A Simple Method of X-Ray Microscopy and Its Application to the Study of Deformed Metals. R. W. K. Honeycombe. *Journal of the Institute of Metals*, v. 19, Sept. 1951, p. 39-44.

A method of obtaining images from metal crystals, using a line source of characteristic X-rays. The images can be enlarged to at least 50 diameters to reveal significant microscopic phenomena, in particular distortions arising from slight plastic deformation which are not readily observed by optical micrography. Scope of the method is illustrated by a series of X-ray and optical micrographs. (M23)

277-M. Crystal Structures of AzZnAs and NaZnAs. (In German.) N. Nowotny and B. Glatzl. *Monatshefte fur Chemie*, v. 82, No. 4, 1951, p. 720-722.

The above stoichiometrically composed alloys were investigated and found to have a fluorspar structure. Lattice constants are presented and discussed.
(M26, Ag, Na, Zn, As)

278-M. Identification and Mode of Formation and Re-Solution of Sigma Phase in Austenitic Chromium-Nickel Steels. E. J. Dulis and G. V. Smith. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 3-29; disc., p. 30-37.

Previously abstracted from *American Society for Testing Materials*, Preprint 50, 1950. See item 211-M, 1950. (M26, N8, SS)

279-M. X-Ray Study of the Sigma Phase in Various Alloy Systems. Pol Duwez and Spencer R. Baen. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 48-54; disc., p. 55-60.

Previously abstracted from *American Society for Testing Materials*, Preprint 47, 1950. See item 210-M, 1950. (M26, Fe, Co, Ni, Cr, V)

280-M. Sigma Phase in Chromium-Molybdenum Alloys with Iron or Nickel. John W. Putman, N. J. Grant, and D. S. Bloom. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 61-68; disc., p. 69-70.

Formation of sigma in a simple alloy of Cr, Mo, and Fe. The extent of the sigma phase in the Cr-Mo-Fe ternary diagram was determined, and some of the properties of the sigma occurring in this system are described. X-ray diffraction data on Cr-Mo-Ni sigma are included.
(M27, N6, SS)

281-M. The Tetragonality of the Sigma Phase in the Iron-Chromium System. L. Menezes, J. K. Roros, and T. A. Read. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 71-74; disc., p. 74.

Preparation of single-crystal specimens of the 50% Fe, 50% Cr sigma phase by isothermal transformation of coarse-grained ferrite of this composition at 775° C. (M26, SS)

282-M. Sigma Phase and Other Effects of Prolonged Heating at Elevated Temperatures on 25 Per Cent Chromium-20 Per Cent Nickel Steel. G. N. Emmanuel. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 82-99; disc., p. 120-121.

Previously abstracted from *American Society for Testing Materials*, Preprint 52, 1950. See item 212-M, 1950. (M26, N3, Q general, SS))

283-M. The Occurrence of the Sigma and Its Effect on Certain Properties of Cast Fe-Ni-Cr Alloys. J. H.

Jackson. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 100-119; disc., p. 120-127.

These alloys are used for heat resistant castings and particular discussion is given of the HF (cast 26% Cr, 12% Ni) and the HK (cast 26% Cr, 20% Ni) alloys. Mechanical properties and microstructures are emphasized. 13 ref.
(M27, Q general, SS)

284-M. Correlation of Structure and Test-Bar Properties of 85-5-5-5 Alloy. (Continued.) L. W. Eastwood and J. G. Kura. *Foundry*, v. 79, Oct. 1951, p. 120-124, 226-230.

Results of an investigation show that the structural features (other than the Cu-Sn-Zn matrix) which mainly appear to determine the tensile properties of 85-5-5-5 alloy are quantity, shape and size of the voids constituting microporosity, the size and shape of the lead particles, and the occurrence of localized shrinkage. Microradiographs are shown. (M27, E25, Cu)

285-M. Intermediate Phases in Ternary Alloy Systems of Transition Elements. Sheldon Rideout, W. D. Manly, E. L. Kamen, B. S. Lement, and Paul A. Beck. *Journal of Metals*, v. 3, Oct. 1951. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 872-876.

The 1200° C. isothermal sections of the following ternary phase diagrams were investigated: Cr-Co-Ni, Cr-Co-Fe, Cr-Co-Mo, and Cr-Ni-Mo. In all these systems, the σ phase was found to form extended solid solutions. Two new ternary phases of unknown structure were identified. 13 ref. (M24, AY)

286-M. Systems Titanium-Molybdenum and Titanium-Columbium. M. Hansen, E. L. Kamen, H. D. Kessler, and D. J. McPherson. *Journal of Metals*, v. 3, Oct. 1951. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 881-888.

The highly reactive Ti-Mo and Ti-Cb alloys were prepared and heat treated under protective conditions. Phase diagrams were established based on micrographic and X-ray diffraction analysis and detection of incipient melting. β-Ti forms a continuous series of solid solutions with both Mo and Cb, whereas these metals are only slightly soluble in the α-Ti modification. 14 ref.
(M24, Ti, Mo, Cb)

287-M. Solubility Relationships in Some of the Ternary Systems of Refractory Monocarbides. John T. Norton and A. L. Mowry. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 923-925.

Isothermal sections of the pseudoternary carbide systems TiC-VC-ZrC, TaC-VC-ZrC and NbC-VC-ZrC were examined. Isoparametric lines were determined which show the curvature of the single-phase field and the direction of tie lines in the two-phase field. Phase diagrams are given. (M24, C-n)

288-M. Structure of Electrolytically Separated Martensite. *Metal Progress*, v. 60, Sept. 1951, p. 136. (Translated and condensed from "Structure of Martensite Separated Electrolytically From Quenched Steel," M. P. Arbuzov.

Previously abstracted from *Doklady Akademii Nauk SSSR*, [Reports of the Academy of Sciences of the USSR.] See item 9-M, 1951.
(M26, ST)

289-M. Intense Gallium X-Rays for Microradiography and Diffraction Investigations. A. Taylor. *Nature*, v. 168, Sept. 15, 1951, p. 471-472.

Intense gallium X-rays provide the only radiation capable of discriminating satisfactorily between Cu and Zn-rich segregates.
(M22, M23, Cu, Zn)

290-M. Factors Affecting the Solubility of Carbon in Iron. R. V. Riley. *Foundry Trade Journal*, v. 91, Sept. 20, 1951, p. 331-339; Sept. 27, 1951, p. 363-368; disc., p. 368-371.

Experiments were carried out in laboratory cupola furnaces in which carefully controlled conditions were maintained. C solubility in Fe was determined in selected atmospheres of H_2, O_2, N_2, and air, at normal and low temperatures, and in vacuo. It is shown that available knowledge on the form of the liquidus of Fe-C alloys containing over 4.5% is incomplete. Metallographic examinations were made showing the effects of various conditions on structure. 41 ref. (M24, N12, E10, CI)

291-M. Carbide Phase in Tempered Steel. K. H. Jack. *Metal Progress*, v. 60, Oct. 1951, p. 11.

Work of the author in comparison with that of M. P. Arbuzov in the USSR, indicating areas of agreement and disagreement. (M27, J29, ST)

292-M. The Ternary Aluminum-Iron-Silicon System. (In German.) H. Nowotny, K. Komarck, and J. Kromer. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 96, Aug. 1951, p. 161-169.

X-ray, thermoanalytical, and microscopic studies of 150 alloys composed of up to 45% Fe, 30% Si, rest Al, explained several discrepancies in the results obtained by other authors. Experimental method and results. A graph shows the effect of Fe and Si on susceptibility to cracking and on length of crack. Also includes X-ray diagrams and photomicrographs. 31 ref. (M24, Al, Fe, Si)

293-M. (Book) **Symposium on the Nature, Occurrence, and Effects of Sigma Phase.** 181 pages. 1951. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. (Special Technical Publication 110.) $2.50.

In general, discusses the occurrence of sigma in the commercial types of Fe-Cr and Fe-Cr-Ni alloys in which it appears as a relatively low - temperature transformation product of a phase stable at high temperatures. Each paper is abstracted separately. (M26, N6, SS)

294-M. (Book) **Contribution a l'emploi des methodes optiques en metallographie microscopique. Application aux bronzes, aux alliages cuivre-antimoine et a une serie de siliciures.** (Contribution to Use of Optical Methods in Microscopic Metallography. Application to Bronzes, Copper-Antimony Alloys and to Series of Silicides.) Theophile Cambon. 107 pages. 1949. Service de Documentation et d'Information Technique de l'Aeronautique, 2 rue de la Port-d'Issay, Paris 15, France.

General methods such as analysis of polished surfaces, and crystallographic analysis; the techniques applied, and research on various alloys. 73 ref. (M21, Cu, Zn, Sb)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

254-N. Solid-State Reactions in Phase Equilibrium Research. II. (Concluded.) Wilfrid R. Foster. *American Ceramic Society Bulletin*, v. 30, Sept. 15, 1951, p. 291-296.

The preceding part included a discussion of solid-state reactions in two-component systems. Part II presents a study of the three-component and multicomponent systems.
(N general)

255-N. The Allotropic Transformation of Hafnium. Pol Duwez. *Journal of Applied Physics*, v. 22, Sept. 1951, p. 1174-1175.

The existence of an allotropic transformation in hafnium, suggested by Zwikker in 1926, is confirmed. The transformation temperature is 1310 ± 10° C. The high-temperature beta form is believed to be body-centered cubic. (N6, Hf)

256-N. A Reinterpretation of Experiments on Intermetallic Diffusion. A. S. Nowick. *Journal of Applied Physics*, v. 22, Sept. 1951, p. 1182-1186.

Reported values for the heat of activation, for volume chemical diffusion, as obtained from the slope of the best straight line in a semilogarithmic plot of diffusion data vs. reciprocal of temperature, may often be greatly in error. A method is presented which attempts to avoid such errors by using the calculated values of Zener for the intercept of the straight line. 20 ref. (N1)

257-N. On the Orientations of Zinc Crystals Produced by the Bridgman Method. L. M. Slifkin. *Journal of Applied Physics*, v. 22, Sept. 1951, p. 1216.

The effect that the geometry of a crucible can have on the orientation of crystal growth. (N12, M26, Zn)

258-N. Diffusion of Copper in Aluminium in the Presence of Calcium. Mladen Paic. *Metal Treatment and Drop Forging*, v. 18, Sept. 1951, p. 395-399.

Previously abstracted from *Revue de Métallurgie*. See item 107-N, 1951.
(N1, Al, Cu)

259-N. The Formation of Sigma Phase in 17 Per Cent Chromium Steel. J. J. Heger. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 75-78; disc., p. 79-81.

Previously abstracted from *American Society for Testing Materials*, Preprint 53, 1950. See item 148-N, 1950. (N8, SS)

260-N. Structural Transformations in the Tempering of High-Carbon Martensitic Steels. K. H. Jack. *Journal of the Iron and Steel Institute*, v. 169, Sept. 1951, p. 26-36.

X-ray investigations on the nature of the 1st and 3rd stages which are associated with decomposition of martensite into ferrite and cementite. 33 ref. (N8, J29, ST)

261-N. Effects of Tungsten or Molybdenum Upon the Alpha-Beta Transformation and Gamma Precipitation in Cobalt-Chromium Alloys. E. E. Fletcher and A. R. Elsea. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 897-902.

Metallographic investigation shows that W has little effect upon the α-β transformation temperature range, while Mo tends to raise it. Both elements tend to promote the formation of γ phase, Mo being more potent in this respect than W.
(N6, N7, Co, Cr)

262-N. Isothermal Transformation and Properties of a Commercial Aluminum Bronze. A. H. Kasberg, Jr., and David J. Mack. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 903-908.

The isothermal transformation diagram of the alloy was first determined. On this basis, the heat treatments necessary to produce representative structures were selected and mechanical properties determined. 14 ref. (N9, Q general, Cu)

263-N. Experimental Evidence for the Vacancy Mechanism in Diffusion in Metals and Alloys. Foster C. Nix and Frank E. Jaumot, Jr. *Physical Review,* ser. 2, v. 83, Sept. 15, 1951, p. 1275-1276.

There has been much discussion as to the possibility of using an alloy system such as Fe-Al, Ni-Al, or Co-Al, near the 50-50 at. % composition, to test the vacancy theory of diffusion. Investigations on the diffusion of Co-Al alloys. (N1, Co, Al)

264-N. The Macromosaic Structure of Tin Single Crystals. E. Teghtsoonian and Bruce Chalmers. *Canadian Journal of Physics,* v. 29, Sept. 1951, p. 370-381.

Single crystals of high-purity Sn grown from the melt by modified Bridgman method are shown to be partitioned into bands, or striations. Properties of the striations are shown to be dependent on both rate of growth and crystallographic orientation relative to the direction of heat flow. A tentative explanation in terms of formation of edge-type dislocations from condensation of vacant lattice sites. 14 ref.
(N12, M26, Sn)

265-N. Dendritic Growth in Lead. F. Weinberg and Bruce Chalmers. *Canadian Journal of Physics,* v. 29, Sept. 1951, p. 382-392.

Dendritic growth was revealed by decanting the remaining liquid at various stages of solidification. Direction of growth was determined as a function of crystallographic orientation and direction of solidification. An explanation is advanced for the presence of the substructure in terms of dendritic growth based on observed properties.
(N12, Pb)

266-N. A Unified Picture of Diffusion. J. D. Babbitt. *Canadian Journal of Physics,* v. 29, Sept. 1951, p. 427-436.

Applies the fundamental equation developed earlier to diffusion in liquid and solid solutions and shows that this equation leads to the same expression as current theories of such diffusion. Application to diffusion of a solute into a solvent when the latter is stationary, to diffusion of metals in metals, and to diffusion of gases through adsorbing solids. (N1)

267-N. Note on the Solubility of Iron in Liquid Magnesium-Aluminum Alloys. W. A. Baker and M. D. Eborall. *Metallurgia,* v. 44, Sept. 1951, p. 145-146.

Experimental procedure, graph and table of solubility, and discussion of results. (N12, Mg, Al, Fe)

268-N. Graphitization of Steel. A. M. Hall and H. M. Banta. *Oil and Gas Journal,* v. 50, Oct. 11, 1951, p. 101-102, 105-106.

Graphitization has caused several spectacular failures in steam lines and the same phenomenon may be present in petroleum refining, especially in catalytic cracking. Briefly explains the phenomenon of graphitization and information applicable to the petroleum refining industry. (N8, ST)

P

PHYSICAL PROPERTIES AND TEST METHODS

310-P. Physical Chemistry of High-Temperature Reactions. John Chipman. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 531-591.

A concise review of principles of physical chemistry that have proved useful in studies of steelmaking. Data that are essential to the application of physical chemistry to reactions at high temperatures. 44 ref.
(P12, D general)

311-P. Kinetics of Metallurgical Processes. Lawrence S. Darken. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 592-620.

Rate theory, diffusion, thermal conductivity and diffusion, and nucleation and growth process. 21 ref.
(P12, N1, N2)

312-P. Physical Chemistry of Liquid Steel. John Chipman. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 621-690.

Properties of iron at high temperatures; chemical reactions in liquid steel; activity and free energy in liquid steel; oxidation and deoxidation equilibria; reactions of sulfur in liquid steel; removal of nitrogen; and hydrogen in liquid steel. 51 ref.
(P12, D2, Fe, ST)

313-P. The Electron Theory of Solids. J. C. Slater. *American Journal of Physics,* v. 19, Sept. 1951, p. 368-374.

The original ideas of Lorentz and Drude on the electron theory of solids have been expanded to cover the quantum theory of the electron gas, the energy-band theory, with applications to the distinction between conductors, semiconductors, and insulators, and to treat not only electrical conductivity, but mechanical, thermal, and magnetic properties of solids, and a wide range of phenomena. (P15, Q general)

314-P. Surface Tension of Liquid Metals. N. R. Mukherjee. *Journal of Applied Physics,* v. 22, Sept. 1951, p. 1215-1216.

Surveys the literature. Surface tension of liquid metals is believed to be proportional to their molar latent heat of fusion. (P10)

315-P. Contact Potential Differences. Imre F. Patai and Martin A. Pomerantz. *Journal of the Franklin Institute,* v. 252, Sept. 1951, p. 239-260.

Fundamental aspects, with critical consideration of experimental methods of determining contact-potential differences. Small temperature effects which are known to occur, but which are orders of magnitude smaller than contact potentials, are not mentioned. The additional complications inherent in the nature of the contact between a metal and a semiconductor are avoided by restricting the discussions to metals only. 87 ref. (P15)

316-P. Reflection and Transmission of Radiation by Metal Films and the Influence of Nonabsorbing Backings. Louis Harris, John K. Beasley, and Arthur L. Loeb. *Journal of the Optical Society of America,* v. 41, Sept. 1951, p. 604-614.

A set of equations is presented. Using these equations, the results of two different methods of calculation of the reflection and transmission coefficient of a thick nonabsorbing plate are shown to be practically identical, both with and without an absorbing (metal) film on one surface of the plate. (P17)

317-P. Wave Propagation in One-Dimensional Structures. J. M. Luttinger. *Philips Research Reports,* v. 6, Aug. 1951, p. 303-310.

A conjecture of Saxon and Hutner on the forbidden energy levels of any substitutional alloy of a certain one-dimensional crystal model is proven. Analogous results are derived for wave transmission down a line loaded with two-terminals.
(P15)

318-P. The Characteristic Odor of Nodular Iron Fractures and Carbide Slags. B. F. Brown. *Foundry,* v. 79, Oct. 1951, p. 174.

The odor is attributed to PH_3 and to a lesser extent to H_2S. Equations for the reactions involved are given.
(P13, CI, C-n)

319-P. Proposed Method for Measuring Electrical Resistance of Coatings. Walter F. Rogers, B. H. Davis, Lyle Sheppard, L. G. Sharp, E. R. Allen, Donald Bond, and P. T. Miller. *Gas Age,* v. 108, Sept. 27, 1951, p. 31-35, 70-72.

Previously abstracted from *Corrosion,* (Technical Section). See item 225-P, 1951. (P15, L26, ST)

320-P. Thermogalvanic Potentials. I. The Application of Thermodynamics to Thermogalvanic Data (A Study of the Silver Chloride Electrode from 25° to 90° C). Harry Levin and Charles F. Bonilla. *Journal of the Electrochemical Society,* v. 98, Oct. 1951, p. 388-394.

Probability that thermogalvanic data may find application in the approximate determination of thermodynamic constants, in the measurement of concentration changes in industrial processes, and in the interpretation of thermal corrosion.
(P12, R1)

321-P. The Kinetics of the Reduction of Iron Oxide Above 1400° C. T. E. Dancy. *Journal of the Iron and Steel Institute,* v. 169, Sept. 1951, p. 17-24.

An apparatus was developed for the study of the very rapid reduction of FeO and Fe_3O_4 by carbon in molten pig iron. Oxide attack on the refractory was prevented by using a spinning crucible, and the reaction was followed by motion-picture recording of a low-inertia pressure gage. Temperature coefficients determined from activation energy and from "order of reaction" curves showed reasonable agreement.
(P12, Fe)

322-P. A Modification of Sucksmith's Method for the Measurement of Susceptibilities of Para- and Ferromagnetic Materials at Temperatures Between −180° C and 1100° C. W. P. Van Oort. *Journal of Scientific Instruments,* v. 28, Sept. 1951, p. 279-282.

Special attention is paid to the construction of a low and a high-temperature thermostat of such dimensions as to ensure easy handling in a pole gap not wider than 16 mm.
(P16)

323-P. Adsorption by Aluminum in the Soft X-Ray Region. D. H. Tomboulian and E. M. Pell. *Physical Review,* ser. 2, v. 83, Sept. 15, 1951, p. 1196-1201.

Measurements on adsorption by Al in the spectral range from 80 to 600 A, using a grazing incidence spectrograph. (P13, Al)

324-P. The Magnetostriction of Single Crystals of Iron-Silicon Alloys. W. J. Carr, Jr., and R. Smoluchowski. *Physical Review,* ser. 2, v. 83, Sept. 15, 1951, p. 1236-1243.

The spontaneous magnetostriction of Fe-Si alloys can be adequately described by two constants, h_1 and h_2. A method is given for calculating the constants accurately from the experimental data. The form effect is calculated and a semi-empirical theory is given for the influence of Si on magnetostriction.
(P16, Fe, Si)

325-P. Study of Macroscopic Magnetic Structure. (In French.) Israel Epelboin. *Comtes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, July 30, 1951, p. 358-360.

Study of magnetism in the Rayleigh field permits an interpretation

of ferromagnetic behavior in weak alternating fields and of the distribution of permeability in the thickness of sample. Samples of ferronickel were used. (P16, Fe, Ni)

326-P. Method for Determining Surface Tension of Solids. (In French.) Carl Benedicks. *Comtes Rendus hebdomadaires des Seances de l'Academie des Sciences,* v. 233, July 30, 1951, p. 409-410.

Method is based on the "negative wetting" effect for six different samples. This varied between 87 (sugar) and 228 dynes per cm. (annealed steel). These values agree with theoretical predictions. (P10, ST)

327-P. Differential Thermoelectric Force of Thin Layers of Metal. (In German.) E. Justi, M. Kohler, and G. Lautz. *Zeitschrift für Naturforschung,* v. 6a, Aug. 1951, p. 456-462.

For thin vapor-deposited layers of spectroscopically pure Bi, the theoretically expected reduction of the differential thermo-electric force with layer thickness is experimentally proved. Several possible explanations of the phenomenon. (P15, Bi)

328-P. Effect of a Magnetic Field on Crystallization and on the Composition of Solid Solutions. (In German.) Giovanna Mayr. *Zeitschrift für Naturforschung,* v. 6a, Aug. 1951, p. 467.

Discusses experimental results previously published in five different articles. The Co-Cu system, Bi, and Cd are considered.
(P16, M24, Co, Cu, Bi, Cd)

329-P. Low Temperature Heat Capacities of Inorganic Solids. VIII. Heat Capacity of Zirconium From 14 to 3000° K. Gordon B. Skinner and Herrick L. Johnston. **IX. Heat Capacity and Thermodynamic Properties of Cuprous Oxide From 14 to 300° K.** Jih-Keng Hu and Herrick L. Johnston. *Journal of the American Chemical Society,* v. 73, Oct. 1951, p. 4549-4551.

12 references. (P12, Zr)

330-P. The Vapor Pressures of Inorganic Substances. VI. Vanadium Between 1666° K. and 1882° K. James W. Edwards, Herrick L. Johnston, and Paul E. Blackburn. **VII. Iron Between 1356° K. and 1519° K. and Cobalt Between 1363° K. and 1522° K.** James W. Edwards, Herrick L. Johnston, and Walter E. Ditmars. *Journal of the American Chemical Society,* v. 73, Oct. 1951, p. 4727-4732.

Results are charted and tabulated. Apparatus and procedure. 14 ref. (P12, V, Fe, Co)

331-P. The Solubility of Copper in Liquid Lead Below 950°. O. J. Kleppa and J. A. Weil. *Journal of the American Chemical Society,* v. 73, Oct. 1951, p. 4848-4850.

The Pb-rich region of the Cu-Pb phase diagram was studied by a solubility method. The shape of the liquidus curve between 950° C. and the eutectic temperature (326° C.) was determined. From the data obtained, the differential heat of solution (relative partial molal heat content) and the excess (non-ideal) partial molar entropy of mixing were calculated for Cu at very low concentrations in liquid Pb.
(P12, N12, Pb, Cu)

332-P. The Dissociation Pressures of Thorium Dihydride in the Thorium-Thorium Dihydride System. Manley W. Mallett and Ivor E. Campbell. *Journal of the American Chemical Society,* v. 73, Oct. 1951, p. 4850-4852.

Measured for the range of compositions up to approximately $ThH_{1.90}$ at temperatures of 650-875° C. The system resembles the Pd-H system in that the observed dissociation pressures are dependent on the solid-phase composition throughout the system. 11 ref. (P12, Th)

333-P. Corresponding or Homologous Temperatures. Albert M. Portevin. *Metal Progress,* v. 60, Oct. 1951, p. 109-110.

Use of room temperature or the centrigrade scale masks relationships which exist among the properties of metals. Recommends use of "corresponding" or "homologous" scales for each metal, running from zero at absolute zero to 100 at melting point of the given metal. Some useful results of this approach. (P11)

334-P. Resolution of Annealing Experiments for the Study of Non-Equilibrium States. Philip Schwed. *National Advisory Committee for Aeronautics,* Research Memorandum E51G24, Sept. 27, 1951, 15 pages.

Insight into the condition of a solid which is not in the equilibrium state may be obtained by determining the manner in which properties of the solid change as it is annealed. In general, annealing is done either by subjecting the sample to a series of fixed temperatures, or by steadily raising the temperature. In either case, the way in which the property studied changes during annealing makes it possible to distinguish non-equilibrium states of sufficiently different activation energies. A resolving power is defined for each of these two techniques. Equations are derived which can be used to evaluate the merits of an annealing experiment on the basis of these definitions. Treatment is strictly theoretical and mathematical.
(P12, N general)

335-P. A Theory of Conductivity of Cold-Worked Copper. Rolf Landauer. *National Advisory Committee for Aeronautics,* Technical Note 2439, Sept. 1951, 23 pages.

The increase in the resistivity of Cu under cold working is calculated. The increase is assumed to be caused by dislocations surrounded by a long-range electrostatic field that scatters the conduction electrons. From the calculated increment in resistance and the known increase of resistivity of heavily cold-worked copper, the number of dislocations was found to be in agreement with the number estimated on the basis of stored-energy measurements.
(P15, Cu)

336-P. Penetration of Magnetic Fields into Superconductors III. Measurements on Thin Films of Tin, Lead and Indium. J. M. Lock. *Proceedings of the Royal Society,* ser. A, v. 208, Sept. 7, 1951, p. 391-408.

Magnetic moments of thin superconducting films of Sn, Pb, and In, obtained by evaporation of the metal in vacuo, were measured by a ballistic method. Values of penetration depth at absolute zero, derived from them by extrapolation, are estimated. Within limits of experimental error, the results agree with the penetration law of London & London. 18 ref. (P16, Sn, Pb, In)

337-P. (Book) **Aktuelle Forschungs-Probleme aus der Physik Dünner Schichten.** (Timely Research Problems in the Physics of Thin Layers.) Herbert Mayer. 142 pages. 1950. R. Oldenbourg, Munich, Germany.

Importance of the thin layer to research and technology, especially in the study of boundary surface and boundary layer effects, of the transitions from atomic molecular layers to the microscopic body and the accompanying change in physical properties and microscopic physical phenomena. Various methods of studying surface roughness; the transition from the individual metal atom to the compact metal; the Weiss-Heisenberg molecular ranges of ferromagnetic bodies; superconduction of thin layers; principles of the external photo-electric effect on metals; adsorptive layers and coefficient of accommodation.
(P10, M general, S15)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

650-Q. Influences of Grain Flow on the Strength of Lugs. G. I. Robinson. *Aircraft Engineering,* v. 23, Sept. 1951, p. 257-260.

Discusses an article by D. L. McElhinney, published in the Mar. 1951, issue on "The Effect of Light Alloy Extrusions" (see item 189-Q, 1951) which reviewed the results of a series of tests on longitudinal and transverse-grain lugs machined from extruded bar. Recommendations as to the design of lugs manufactured from extruded bar were extended to lugs manufactured from forged material. It is felt that these recommendations—at least in so far as forged lugs are concerned—do not cover all contingencies. A tentative hypothesis is proposed, to account for failures encountered.
(Q24, Q25, Al)

651-Q. Properties of Steel as Influenced by Constitution. A. G. Forrest, and R. W. Farley. *American Institute of Mining and Metallurgical Engineers,* "Basic Open Hearth Steelmaking," Ed. 2, 1951, p. 490-527.

Relations between steel constitution and properties, such as chemical composition, its uniformity and relation to the properties austenitic grain size, hardenability, and machinability. 30 ref.
(Q general, G17, J26, M24, ST)

652-Q. Nickel, Aluminum, Molybdenum Alloys for Service at Elevated Temperatures. H. V. Kinsey and M. T. Stewart. *Industrial Heating,* v. 18, Sept. 1951, p. 1586, 1588, 1590. (A condensation.)

Development and testing of nickel-rich, Ni-Al-Mo alloys for high-temperature applications such as gas-turbine blades.
(Q general, T25, Ni, SG-h)

653-Q. Determining Physical Properties and Testing Finished Products. Howard C. Roberts. "The Handbook of Measurement and Control," *Instruments Publishing Co.* (Pittsburgh), 1951, p. 197-202.

Tabular arrangement of testing methods. Tables are representative of the most widely used methods for determining the properties found most useful in science and in industry. (Q general, P general)

654-Q. Hot Hardness of Plated Finishes Measured. *Iron Age,* v. 168, Sept. 20, 1951, p. 119. (Based on work by Abner Brenner of National Bureau of Standards.)

Previously abstracted from *Journal of Research of the National Bureau of Standards.* See item 89-Q, 1951. (Q29)

655-Q. Embrittlement of Tempered Martensite Better Defined. P. Payson. *Iron Age,* v. 168, Sept. 27, 1951, p. 86-89.

There is a minimum in the notch-impact vs. tempering-temperature curve of hardened steel at about 600° F. temper. This phenomenon unfortunately has sometimes been referred to as "temper embrittlement," and sometimes even as "blue brittleness." An attempt is made to point out the distinct differences between them. Data on impact properties of various steels are graphed and tabulated. (Q23, Q6, ST)

656-Q. Production Problems. VIII. Fractured Wire Rope. *Iron and Steel,* v. 24, Sept. 1951, p. 421-422.

An investigation on the primary causes of failure in wire rope.
(Q26, S13, ST)

657-Q. Some Experimental Indications of the Stresses Produced in a Body by an Exploding Charge. John S. Rinehart. *Journal of Applied Physics*, v. 22, Sept. 1951, p. 1178-1181.

Effects produced by small cylindrical charges detonated on the surfaces of heavy steel plates. Particular attention is paid to shapes of crater, changes in hardness, flow patterns, fractures, and changes in microstructure. The distribution of stress appears in some respects to correspond to that which might be set up by a static load.
(Q25, M27, ST)

658-Q. Some Observations on the Occurrence of Stretcher-Strain Markings in an Aluminium-Magnesium Alloy. R. Chadwick and W. H. L. Hooper. *Journal of the Institute of Metals*, v. 19, Sept. 1951, p. 17-22.

Detailed observations of the appearance and dimensional distortion associated with surface markings developed by the progressive stretching of Al + 3% Mg alloy sheet in different conditions of cold working and annealing. (Q24, Al)

659-Q. Creep and Stress Rupture as Rate Processes. Italo S. Servi and N. J. Grant. *Journal of the Institute of Metals*, v. 19, Sept. 1951, p. 33-37.

Creep data for an Fe-Co-Cr-Ni alloy reported by Grant and Bucklin are analyzed according to the rate-process theory of plastic flow. The data indicate that the theory can be applied over only a limited range of creep rates. An empirical equation, which relates applied stress and the temperature to minimum creep rate, is suggested for analysis of creep data. This equation is valid only in the absence of structural instabilities. 12 ref. (Q3, Q4)

660-Q. How to Determine Toughness of Steels from Notched Bar Tests. E. J. Ripling. *Materials & Methods*, v. 34, Sept. 1951, p. 81-85.

Charts show notched properties as a function of tensile strength, which can be used to indicate safe and unsafe strength levels, and which make it possible to compare the toughness properties of steels at the same hardness. (Q23, ST)

661-Q. High Temperature Properties of Stainless Steel Tubing. *Materials & Methods*, v. 34, Sept. 1951, p. 113.

Tabular data on mechanical and physical properties of seven types. Includes temperature of inception of embrittling grain growth, resistance to intergranular carbide precipitation, and safe temperatures for use in oxidizing atmospheres.
(Q general, P general, R2, SS, SG-h)

662-Q. Mechanical Properties of α-Solid Solutions of Copper With Zinc, Gallium, Germanium and Arsenic. N. P. Allen, T. H. Schofield and A. E. L. Tate. *Nature*, v. 168, Sept. 1, 1951, p. 378-379.

Tensile properties of Cu-Zn, Cu-Ga, Cu-Ge, and Cu-As solid-solution alloys in wire form were examined. Results indicate that when these alloys are produced by identical methods in the form of soft annealed wires of approximately equal grain size, the ultimate tensile strength and resistance to plastic deformation appear to be almost entirely governed by electron-atom ratio.
(Q23, Cu, Zn, Ge, Ga, As)

663-Q. NBS Micro Hot-Hardness Tester. Abner Brenner. *Technical News Bulletin* (National Bureau of Standards), v. 35, Sept. 1951, p. 134-136.

Previously abstracted from *Journal of Research of the National Bureau of Standards*. See item 89-Q, 1951.
(Q29)

664-Q. Light Alloys for Modern Aircraft; Constant Search for Improved Materials. *Times Review of Industry*, v. 5, Sept. 1951, p. 46, 49.

Work being done in the research foundry of a British firm. Methods of studying mechanical properties and constitution of light alloys.
(Q general, T24, Al, Mg)

665-Q. Upper and Lower Transitions in Charpy Test. W. J. Harris, Jr., J. A. Rinebolt and R. Raring. *Welding Journal*, v. 30, Sept. 1951, p. 417s-422s.

Charpy V-notch specimens of medium-carbon steels were tested in impact by multiple low-velocity, low-energy blows. Under these conditions, a discontinuity in the energy-temperature discontinuity was associated with the occurrence of plastic-strain markings on the sides and top of the specimens. (Q6, CN)

666-Q. Residual Stresses in Welded Mild-Steel Pipe. L. J. Privoznik. *Welding Journal*, v. 30, Sept. 1951, p. 422s-428s.

Stresses due to circumferential single-V butt welds, made with five passes in 5½-in. O.D., ½-in. wall thickness, mild steel pipe, were determined by the Sachs boring-out method. Effects of various welding procedures upon magnitude of stresses, both in the weld and in the parent metal 1¼ in. from the weld, were investigated. Effects of various welding, thermal-stress-relief, and annealing procedures were determined. (Q25, K general, K9, CN)

667-Q. Stresses in Large Horizontal Cylindrical Pressure Vessel on Two Saddle Supports. L. P. Zick. *Welding Journal*, v. 30, Sept. 1951, p. 435s-445s.

Indicates the approximate stresses in cylindrical vessels supported on two saddles at various locations. Knowing these stresses, it is possible to determine which vessels may be designed for internal pressure alone, and to design structurally adequate and economical stiffening for the vessels which require it. Formulas are developed to cover various conditions. A chart covers support designs for pressure vessels made of mild steel for storage of liquid weighing 42 lb. per cu. ft.
(Q25, CN)

668-Q. The Effect of Fabrication Processes on Steels Used in Pressure Vessels. S. S. Tör, J. M. Ruzek, and R. D. Stout. *Welding Journal*, v. 30, Sept. 1951, p. 446s-450s.

Notch toughness of steel plate which had been prepared by machining, by flame cutting, or by shearing, was investigated.
(Q23, G17, G22, ST)

669-Q. The Micro-Mechanism of Fracture in the Tension Impact Test; Supplementary Report No. I. Walter H. Bruckner. *Welding Journal*, v. 30, Sept. 1951, p. 459s-469s.

Tension-impact tests of rimmed and killed structural steels in which a spheroidizing heat treatment has eliminated lamellar carbide structure. Numerous graphs and micrographs. (Q27, CN)

670-Q. Sigma Phase in Several Cast Austenitic Steels. V. T. Malcolm and S. Low. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 38-44; disc., p. 45-47.

Previously abstracted from *American Society for Testing Materials*, Preprint 51, 1950. See item 478-Q, 1950. (Q6, M26, SS)

671-Q. Some Notes on the Structure and Impact Resistance of Columbium-Bearing 18-8 Steels After Exposure to Elevated Temperatures. W. O. Binder. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 146-164; disc., p. 164.

Previously abstracted from *American Society for Testing Materials*, Preprint 44, 1950. See item 477-Q, 1950. (Q6, M26, SS)

672-Q. Observations of the Effect of Sigma on the Mechanical Properties of Columbium-Stabilized Weldments in Austenitic Stainless Steels. F. W. Schmitz and M. A. Scheil. *American Society for Testing Materials*, "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 165-177; disc., p. 178-181.

Summary of the investigation of 13 weldments in 1½-in. thick T347 stainless steel on the basis of heat treatments given for stress removal.
(Q25, general, M27, SS)

673-Q. Some Recent Observations in Micro-Hardness Testing. E. Börje Bergsman. *ASTM Bulletin*, Sept. 1951, p. 37-43. (Translated from the Swedish.)

Examines some of the factors responsible for lack of agreement of results in microhardness testing. Influence of indentation speed, length of the contact period, shocks, vibrations, and specimen preparation. Load dependence of hardness number was observed for hardened steel, soft annealed 18-8 stainless steel, and soft iron. 24 ref. (Q29, ST, SS, Fe)

674-Q. Rupture of Oxide Films During Repeated Sliding. A. J. W. Moore and W. J. McG. Tegart. *Australian Journal of Scientific Research*, ser. A., v. 4, June, 1951, p. 181-184.

When Cu specimens are subjected to repeated sliding, nonmetallic particles are included in the surface layers as a result of severe plastic working produced by repeated sliding. Relations between various factors involved. Relation to layers formed by polishing is considered. 10 ref. (Q24, Cu)

675-Q. The Scattered Light Method of Exploration of Stresses in Two- and Three-Dimensional Models. H. T. Jessop. *British Journal of Applied Physics*, v. 2, Sept. 1951, p. 249-260.

Investigation shows that the method is practicable and presents no more difficulty than any other method. It possesses considerable advantages in certain cases. By eliminating errors due to averaging the observations over an area of the model, the method removes one of the main obstacles to accurate determination of stresses in three dimensions. (Q25)

676-Q. Photoelastic Determination of Free Boundary Stresses on "Frozen Stress" Models by an Oblique Incidence Method. V. M. Hickson. *British Journal of Applied Physics*, v. 2, Sept. 1951, p. 261-269.

The methods of determining the stress at the boundary of a three-dimensional photo-elastic model are reviewed and the oblique incidence method is investigated in some detail. Tests were carried out on a grooved cylinder in which a comparison was made between oblique incidence determinations of the boundary stresses and determinations from slices cut in the directions of the boundary principal stresses. (Q25)

677-Q. The Influence of Surface Roughness Upon the Impact Strength of Steels at Low Temperatures. G. I. Pogodin-Alexeyeff and A. V. Pamfiloff. *Engineers' Digest*, v. 12, Sept. 1951, p. 298-299. (Translated and condensed from *Stanki i Instrument* (Machine Tools and Equipment, no. 4, 1951, p. 22-23.)

Investigations into the influence of surface roughness on impact strength at room and subzero temperatures. Data on hard and soft steels are tabulated. (Q6, ST)

678-Q. Uses Broaden for Ductile Iron. *Inco*, v. 25, Autumn edition, 1951, p. 14-15.

Mechanical properties of ductile iron compared with those of iron and steel castings. Applications. (Q general, T general, CI)

679-Q. Metal Transfer From Piston Rings to Cylinders During "Run-In". C. D. Strang and J. T. Burwell. *Institution of Mechanical Engineers, Proceedings (Automobile Div.)*, pt. 4, 1949-50, p. 169-172; disc., p. 173-175.

Piston rings with radioactive Cr wearing-surfaces were used to study the micro-welding between rings and cylinder wall during "run-in" in a small, water-cooled, internal combustion engine. The results indicated that micro-welding and the accompanying transfer of metal were present under the mildest conditions of engine operation. The distribution of micro-welding along the ring-travel was found to correspond to the wear profile observed in engine cylinders by other workers. Pistons were Al alloy; rings were Cr-plated steel or cast iron; and cylinders were SAE-4140 steel or cast iron. (Q9, Al, AY, CI, Cr)

680-Q. Physical and Mechanical Properties of Segregates in Two Alloy Steels. H. M. Finniston and T. D. Fearnehough. *Journal of the Iron and Steel Institute*, v. 169, Sept. 1951, p. 5-12.

Techniques for the measurement. The quantitative differences in properties between the segregates and the matrices surrounding them after various heat treatments; the former are shown to be significantly harder, and to have a higher proof and maximum stress and lower elongation and impact values on all casts. Differences in chemical composition between segregate and matrix. Photomicrographs show structures of segregate and matrix. 10 ref. (Q general, M27, AY)

681-Q. Low-Temperature Fractures in Tempered Alloy Steels. A. R. Entwisle. *Journal of the Iron and Steel Institute*, v. 169, Sept. 1951, p. 36-38.

A study was made of fractures of plain carbon and low-alloy steels at low temperatures, the latter steels being in various states of temper embrittlement. Micrographs of fractures are given. (Q26, AY)

682-Q. Creep and Stress Rupture Behavior of Aluminum As a Function of Purity. Italo S. Servi and Nicholas J. Grant. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 909-916.

Data of minimum creep rates and rupture times for high-purity and commercial aluminum confirm the existence of a transition range from the low-temperature type to high-temperature type behavior. The data are analyzed in line with the suggested theories of deformation of metals. 14 ref. (Q3, Q4, Al)

683-Q. Structure Observations of Aluminum Deformed in Creep at Elevated Temperatures. Italo S. Servi and Nicholas J. Grant. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 917-922.

Metallographic observations. The creep and stress-rupture tests were conducted in simple tension at constant stress. Details on experimental technique. (Q3, Q4, M27, Al)

684-Q. Plasticity of Molybdenum Single Crystals. N. K. Chen and R. Maddin. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 937-944.

In the extension of Mo single crystals at room temperature, the slip planes were investigated. Theories of plasticity of body-centered cubic metals were examined, and an explanation based upon planes of highest atomic density seems plausible to explain the plastic behavior of Mo single crystals. (Q24, Mo)

685-Q. Radioactive Tracers Reveal Friction and Wear of Metals. J. T. Burwell and C. O. Strang. *Metal Progress*, v. 60, Sept. 1951, p. 69-74.

Techniques developed at MIT. Fundamental principles involved. Typical results are tabulated, charted, and illustrated. (Q9, S19)

686-Q. Hardness Scale Selector for Steel. E. F. Bradley. *Metal Progress*, v. 60, Sept. 1951, p. 80, 80B.

Developed by Pratt & Whitney, to provide some means of selecting suitable hardness scales. It applies only to parts of nominally uniform metallographic structure (not carburized or decarburized) and of nominally uniform hardness throughout. (Q29, ST)

687-Q. Strength of Pure Molybdenum at 1800 to 2400° F. Roger A. Long, K. C. Dike, and H. R. Bear. *Metal Progress*, v. 60, Sept. 1951, p. 81-88.

See abstract of "Some Properties of High-Purity Sintered Wrought Molybdenum Metal at Temperatures Up to 2400° F.," *National Advisory Committee for Aeronautics*, Technical Note 2319, Mar. 1951. See item 248-Q, 1951. (Q general, M general, Mo)

688-Q. Low Temperature Properties of Iron and Steel. *Metal Progress*, v. 60, Sept. 1951, p. 98, 100, 102, 104, 106, 108, 110, 112, 114, 116. (Condensed from "Low Temperature Properties of Ferrous Materials," S. A. E. Iron and Steel Technical Committee, *Society of Automotive Engineers.)*

Previously abstracted from original. See item 585-Q, 1950. (Q general, ST)

689-Q. High-Tensile Structural Steel. *Metal Progress*, v. 60, Sept. 1951, p. 122, 124. (Condensed from "Structural High-Tensile (Low-Alloy) Steel," O. A. Kerensky.)

Previously abstracted from *Engineer*. See item 3B-57, 1949. (Q general, T26, CN)

690-Q. Homogeneous Extension of Single Crystals. F. D. Rosi. *Review of Scientific Instruments*, v. 22, Sept. 1951, p. 708-710.

Use of a gimbal and grip arrangement in testing. A greater range of homogeneous deformation is possible. (Q24)

691-Q. The Problem of Wear. (In German.) W. Späth. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 17, July 1951, p. 214-219.

Correlation of hardness, fatigue resistance, and microstructure with wear resistance. Graphs show experimentally established test results. 20 ref. (Q9)

692-Q. Aluminum Pipe. *Heating Piping & Air Conditioning*, v. 23, Oct. 1951, p. 119-121.

Data on bursting pressures at room and elevated temperatures, mechanical and physical properties, also dimensional and head loss data. (Q general, P general, Al)

693-Q. Chrome Plating Affects Plastic Deformation of Steel. *Iron Age*, v. 168, Oct. 18, 1951, p. 101.

Tests at National Bureau of Standards on SAE 4130 steel. (Q24, L17, Cr, AY)

694-Q. Heavy Coiled Springs; Fatigue Properties of Silicon-Manganese Steel Tank Components. (Concluded) W. E. Bardgett and F. Gartside. *Iron and Steel*, v. 24, Sept. 1951, p. 411-416; Oct. 1951, p. 454-458.

Results of a series of tests designed to investigate the effect of difference in method of preparation, of shot peening and of interval stress. Factors which influence endurance behavior such as structure, hardness, degree of decarburization, internal stress of scragging, and relief of stress in testing. (Q7, AY)

695-Q. Testing Machine Aids Research. *Machine Design*, v. 23, Oct. 1951, p. 116.

Use and operation of 3,000,000-lb. universal testing machine by Aluminum Co. of America for determining optimum conditions for extruding, forming and forging Al and Mg and their alloys. (Q general, F general, G general, Al general, Mg)

696-Q. Choosing the Right Low-Temperature Metals. John R. Watt. *Machine Design*, v. 23, Oct. 1951, p. 117-121.

See abstract under similar title from *Refrigerating Engineering;* item 563-Q, 1951. (Q general, Fe, ST)

697-Q. Leaded Versus Lead-Free Gunmetals. E. C. Mantle. *Metal Industry*, v. 79, Sept. 28, 1951, p. 255-256.

Properties of 85-5-5-5 leaded gunmetal are compared with those of the other alloys used for bronze castings, such as Admiralty gunmetal. It is shown that there is a good case for adopting the former for most work involving pressure tightness and tensile strength. Comparative properties are tabulated. (Q23, E25, Cu)

698-Q. Surface Conditions and the Creep of Extruded High-Purity Lead. R. C. Gifkins. *Metallurgia*, v. 44, Sept. 1951, p. 122.

An investigation made into the effect of the presence of the extrusion layer on the creep of Pb. (Q3, Pb)

699-Q. Fatigue Resistance of Heat Treated Aluminum and Beryllium Bronzes. *Metal Progress*, v. 60, Oct. 1951, p. 190, 192, 194. (Condensed from "The Resistance of Aluminum and Beryllium Bronzes to Fatigue and Corrosion Fatigue," D. G. Sopwith, *Aeronautical Research Council*, Reports and Memoranda 2486.)

Results of experiments. (Q7, R1, Cu)

700-Q. Centrifugal Method of Testing at High Temperatures. *Metal Progress*, v. 60, Oct. 1951, p. 194, 198, 202, 204-206. (Translated and condensed from "Centrifugal Method of Testing the Strength of Metals and Alloys at High Temperatures," I. I. Kornilov, and from "The Centrifugal Method of Testing Metals and Alloys at High Temperatures," M. E. Rabinovich.)

Previously abstracted from *Zavodskaya Laboratoriya* (Factory Laboratory). See items 9-124 and 9-316, 1949. (Q23)

701-Q. Development of Research in High-Temperature Rheology of Metals. Paul Feltham. *Metal Treatment and Drop Forging*, v. 18, Sept. 1951, p. 389-394.

Past, current, and possible future work in the high-temperature rheology of metals. Shows that a study of research in its historical, social, and economic setting can materially contribute to its advance. 23 ref. (To be continued). (Q24)

702-Q. Investigation of Influence of Chemical Composition on Forged Modified Low-Carbon N-155 Alloys in Solution Treated and Aged Condition as Related to Rupture Properties at 1200° F. E. E. Reynolds, J. W. Freeman and A. E. White. *National Advisory Committee for Aeronautics*, Technical Note 2449, Sept. 1951, 111 pages.

Modifications investigated included individual variations of each of the ten elements present in low-carbon N-155 and simultaneous variations of Mo, W, and Cb. Indicates that melting and hot working conditions play an important role in

high-temperature properties of alloys of the type investigated.
(Q4, SG-h)

703-Q. Friction of Clean Metals and the Influence of Adsorbed Films. F. P. Bowden and J. E. Young. *Proceedings of the Royal Society,* ser. A, v. 208, Sept. 7, 1951, p. 311-325.

Details of an experimental study of the frictional behavior of thoroughly degassed metal surfaces. Using an apparatus in which friction can be measured at any desired temperature up to 1200° C. or more, either in vacuo or in a particular gas, it was found that when sufficiently clean metals are allowed to touch, even at room temperature, complete seizure occurs. Over the real area of contact, the specimens adhere with the bulk strength of the metal, and this area increases greatly with continued sliding or attempted sliding. Various gases and vapors were adsorbed onto the clean specimens, and their influences on friction determined. Results support the view that friction of metals is due mainly to adhesion at the points of real contact, and is governed by the extent to which even the thinnest of surface films can reduce this contact. 16 ref. (Q9)

704-Q. Effect of Low Temperatures on Aircraft Metals. J. B. Johnson and D. A. Shinn. *Product Engineering,* v. 22, Oct. 1951, p. 187-192.

Effect on mechanical properties.
(Q general)

705-Q. Torsion Spring Charts for Round or Square Wire. H. F. Ross. *Product Engineering,* v. 22, Oct. 1951, p. 203, 205.

Three charts are included for the rapid calculation of helical types of torsional springs which are loaded in a direction tending to reduce the diameter of the coil. These data hold for average conditions where either static or relatively slow varying loads are applied. (Q1, T7)

706-Q. Sheet Metal Bend Allowance and Correction Charts. *Product Engineering,* v. 22, Oct. 1951, p. 207.
(Q5, Al, Mg, ST)

707-Q. NBS Micro Hot-Hardness Tester. *Products Finishing,* v. 16, Oct. 1951, p. 60, 62, 64. (Condensed from "Microhardness Tester for Metals at Elevated Temperatures," Abner Brenner.)

Previously abstracted from *Journal of Research of the National Bureau of Standards.* See item 89-Q, 1951. (Q29)

708-Q. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part VII. R. Weck. *Welder,* v. 20, Jan.-June, 1951, p. 12-22.

Results on the fatigue strength of ordinary unmachined fillet welded joints. Data on design and fatigue strength are tabulated. (To be continued). (Q7, K9, ST)

709-Q. Performance of High-Strength Aluminum Alloy Weldments. W. R. Apblett and W. S. Pellini. *Welding Journal,* v. 30, Oct. 1951, p. 473s-481s.

The effect of major variables allied to stress conditions on the performance of weldments. Tensile-strength data are summarized in tabular form. (Q27, K9, Al)

710-Q. The Effect of Microstructure on Notch Toughness. Part I. J. H. Gross and R. D. Stout. *Welding Journal,* v. 30, Oct. 1951, p. 481s-485s.

Effect of pearlite spacing on the notch toughness of a plain high-carbon steel with different grain sizes. (Q23, M27, CN)

711-Q. Fatigue Strength of Spot-Welded Light Alloy Joints. Hiroshi Kihara. *Welding Journal,* v. 30, Oct. 1951, p. 529s-536s.

Effects of variations in load, plate overlap, pitch of spots, distance between rows, and span on fatigue strength. (Q7, K3, Al)

712-Q. The Creep of Metals. Definitions, Nomenclatures, and Research Methods. (In Dutch.) *Metalen,* v. 6, July 28, 1951, p. 263-268.

Standards and research practices in various countries. (Q3)

713-Q. Copper and Copper Alloys. 4. Bronzes Alloyed With Nickel. (In Dutch.) W. G. R. De Jager. *Metalen,* v. 6, July 15, 1951, p. 255-256; Aug. 15, 1951, p. 292-293.

Composition; and mechanical properties of bearing bronzes are summarized in tabular form. Pressure-cast bronze is discussed and compositions and properties of 14 different alloys are tabulated. Graphs show the effect of Ni content on grain size. (Q general, Cu)

714-Q. Quality Testing of Swedish Cast Iron. (In Swedish.) Bertil Tyberg. *Gjuteriet,* v. 40, July, 1950, p. 97-127; disc., 127-128.

Seventeen Swedish gray-iron foundries of different size and type of production have cast 1680 30-mm. diam. test bars which have been tested by a central organization. The tests performed include chemical analysis, tensile strength, wedge-cutting strength, and Brinell hardness. The results obtained show good agreement with those of recent British and American investigations.
(Q general, CI)

715-Q. (Book) **Theory of Elasticity.** S. Timoshenko and J. N. Goodier. 506 pages. 1951. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, 18, N. Y.

A revision and modernization of the first edition. The treatments of the photo-elastic method, two-dimensional problems in curvilinear coordinates, and thermal stress were rewritten and enlarged into separate new chapters which present many methods and solutions not given in the former edition. An appendix on the method of finite differences and its applications, including the relaxation method, was added. New articles and paragraphs are incorporated. Chapter problems. (Q21, Q25)

R

CORROSION

402-R. Sulphur vs. Construction. James R. West. *Chemical Engineering,* v. 58, Sept. 1951, p. 276, 278, 280-284, 286-288, 290.

A revised article which appeared originally in the Oct. 1946 issue. The major change is a completely rewritten section on stainless steel. This is followed by short articles by other authors: "Worthite", W. E. Pratt; "Chlorimets", Walter A. Luce; "Carbon and Graphite", R. O. Joslyn; "Cements", Raymond B. Seymour; "Coatings", Kenneth Tator; "Durimet 20", Walter A. Luce; "High-Silicon Irons", Walter A. Luce; "Glass Lining", S. W. McCann; "Rubber", J. P. McNamee; "Silicones", J. A. McHard and J. T. McIntyre; "Tantalum" Leonard R. Scribner.
(R6, T29)

403-R. Ceramic Coatings Prevent Exhaust Gas Corrosion. *Corrosion* (New Section), v. 7, 1951, p. 6-7.

Previously abstracted from paper by Dwight G. Moore and Mary A. Mason, *National Advisory Committee for Aeronautics,* Technical Note 2380. See item 329-R, 1951. (R9)

404-R. The Effect of Phosphorus on the Corrosion-Resistance of Magnesium and Some of its Alloys. E. F. Emley, A. C. Jessup, and W. F. Higgins. *Journal of the Institute of Metals,* v. 19, Sept. 1951, p. 23-32.

Corrosion tests were carried out, by total immersion in salt solution, on Mg alloys containing various amounts of phosphorus and other impurities. Corrosion resistance of pure Mg is reduced by the presence of P in amounts over about 0.002%, but this effect can be suppressed by addition of Mn. With a normal Fe content, the adverse effect of P is not suppressed by Mn. Corrosion resistance of high-purity Elektron A8 (Al 8, Zn 0.4, Mn 0.25%, remainder Mg) is also adversely-affected by P. Phosphorus is precipitated from Mg by Zr, and the corrosion resistance of alloys containing Zr is unaffected by P present in the metal used for their preparation.
(R general, Mg)

405-R. Effect of Alloying Elements on Corrosion Resistance of Casting Alloys. D. C. G. Lees. *Light Metals,* v. 14, Sept. 1951, p. 494-502.

Summarizes recent investigations. Comparison between Al alloys with Si, Mg, and Cu under natural atmospheric conditions. 10 ref. (R3, Al)

406-R. A Medium for the Study of the Bacterial Oxidation of Ferrous Iron. William W. Leathen, Lois D. McIntyre, and S. A. Braley, Sr. *Science,* v. 114, Sept. 14, 1951, p. 280-281.

Composition compares favorably with the major chemical composition of acid mine effluents. (R1)

407-R. The Formation of Sigma and Its Influence on the Behavior of Stabilized 18 Per Cent Chromium-8 Per Cent Nickel Steels in Concentrated Nitric Acid. Raymond S. Stewart and Stephen F. Urban. *American Society for Testing Materials,* "Symposium on the Nature, Occurrence, and Effects of Sigma Phase," 1951, p. 128-145.

The sigma phase as the responsible factor for the low corrosion resistance of Ti-stabilized austenitic stainless steels in boiling 65% HNO_3. Factors influencing the formation of sigma phase were studied. 14 ref.
(R5, N6, SS)

408-R. An Investigation of the Longevity of Galvanized Roofing Sheets and Wires. D. J. Swaine. *Chemistry & Industry,* Sept. 15, 1951, p. 764-767.

Investigation of some old and some modern roofing sheets and wires showed that the coating weight of the old materials is greater than that of the modern ones. The difference in other factors, such as purity of coating, Zn-Fe alloy layer, and base material does not indicate a reason for the superior atmospheric corrosion resistance of the old products. The life of a Zn coating depends almost solely on the thickness of the Zn layer. 14 ref.
(R3, L16, Zn, CN)

409-R. Causes of Breakdown in Steam Plant. *Institution of Mechanical Engineers, Proceedings,* v. 164, No. 2, 1951, p. 129-136.

A discussion by various speakers. Causes include mechanical failure of metals, stress-corrosion, reliance on automatic controls and vibrations of parts. (R1, Q general)

410-R. Corrosion of Steel Railway Sleepers: Final Report. J. C. Hudson. *Journal of the Iron and Steel Institute,* v. 169, Sept. 1951, p. 13-16.

The wastage caused by rusting and abrasion of copper-bearing steel sleepers was compared with that suffered by ordinary mild steel sleepers in service tests lasting up to 14 years and made at five places on the British Railways. Under normal circumstances, the resistance of steel sleepers to rusting is adequate, but it can be appreciably increased by using Cu-bearing steel.
(R3, T23, CN, AY)

411-R. Oxidation of Titanium. M. H. Davies and C. E. Birchenall. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 877-880.

Oxidation rate in the range 650°-950° C, was measured. The linear rate law obtained is explained by interface reaction control of the process. Tracer experiments indicate the oxygen diffuses in at least one phase of the scale. 14 ref. (R2, Ti)

412-R. On the Mechanism and Kinetics of the Scaling of Iron. M. H. Davies, M. T. Simnad, and C. E. Birchenall. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 889-896.

A brief survey of the solid phases of the iron-oxygen system, the stability of wüstite in bulk and in thin films, the relative densities of iron in the metal and oxides, and the kinetics of formation of oxide scales on iron. New experimental results were introduced at several points and an attempt was made to formulate a mechanistic picture consistent with these observations. Experimental techniques. 32 ref. (R2, Fe)

413-R. High Temperature Oxidation of Copper-Palladium and Copper-Platinum Alloys. D. E. Thomas. *Journal of Metals*, v. 3, Oct. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 926-936.

Oxidation rate constants were determined for Cu-Pd and Cu-Pt alloys as a function of alloy composition and temperature. Reaction products were identified. Relationship between oxidation rate constants and diffusion constants in the reaction zones. 11 ref. (R2, Cu, Pd, Pt)

414-R. High Chromium Steels Resist Attack by Liquid Bismuth Alloys. John L. Everhart and Edgar L. Van Nuis. *Materials & Methods*, v. 34, Oct. 1951, p. 112-114.

Properties of some of the bismuth alloys. Their use in heat transfer applications depends on suitable material to contain them. Corrosion tests on a number of constructional materials. High-Cr alloys are more resistant than Ni-Cr materials. (R6, P11, SS, Bi)

415-R. Passivity of Type 304. Reed Knox, Jr. *Metal Progress*, v. 60, Sept. 1951, p. 77-78.

During corrosion tests on Type 304 stainless steel in hot 15% H_2SO_4 containing 1.25% NaCl, some unusual phenomena were observed in connection with passivation. Suggests that presence of residual Mo (0.17-0.18%) is responsible for a difference in behavior. (R10, SS)

416-R. Rust Preventives—A General Survey. Arnold W. Ackerman. *Plating*, v. 38, Oct. 1951, p. 1047-1051.

Rust preventives fall in three main classifications: fluids applied at room temperature from solutions and deposited as relatively thin films upon solvent evaporation; solids of various types and consistencies, applied hot; and lubricating oils. Applications. (R10, L general, Fe)

417-R. Corrosion-Prevention Program for a T.C.C. Unit Gas Plant. C. A. Murray and M. A. Furth. *Proceedings, Sixteenth Mid-Year Meeting, Division of Refining, American Petroleum Institute*, v. 31M (III), 1951, p. 99-105; disc., p. 105-106.

Previously abstracted from *Oil and Gas Journal*. See item 227-R, 1951. (R10)

418-R. Hydrogen Attack of Steel in Refinery Equipment. R. T. Effinger, M. L. Renquist, A. Wachter, and J. G. Wilson. *Proceedings, Sixteenth Mid-Year Meeting, Division of Refining, American Petroleum Institute*, v. 31M (III), 1951, p. 107-130; disc., p. 130-133.

Previously abstracted from *Oil and Gas Journal*. See item 237-R, 1951. (R1, N1, CN)

419-R. Industry's Rust Loss Bill Can Be Reduced. George A. Daubert. *Steel*, v. 129, Oct. 11, 1951, p. 81, 84.

Various techniques available for protection of metal parts from corrosion. Four general types specified are solvent dispensol coatings, hot-dip compounds, rust-inhibiting oils, and the volatile, chemically treated papers. (R10, L14, St)

420-R. Periodic Oscillation; Obtained During Anodic Solution of Silver. (In French.) Claude Chalin. *Comptes Rendus Hébdomadaires des Séances de l'Académie des Sciences*, v. 233, July 30, 1951, p. 362-364.

Results of experiments applied to operation of an electrolyzer composed of a 1-mm.-diam. Ag wire anode and a Pt cathode, in an aqueous solution of KCN. (R1, Ag)

421-R. Economics of Rectifier Installation for Cathodic Protection of a Bare Pipe Line. D. C. Glass. *Corrosion*. (Technical Section), v. 7, Oct. 1951, p. 322-325; disc., p. 325-326.

A report on 10 years' operating experience with rectifiers for cathodic protection of a 10-in. crude oil pipe line in the Texas-Gulf Coast area. Design of the system and performance data on rectifiers, experience with ground beds, current requirements to maintain protection, bonding procedures with parallel and/or crossing foreign structures, and leak frequency. An economic study is made of the system. (R10, ST)

422-R. Filamentary Growths on Metal Surfaces—"Whiskers." K. G. Compton, A. Mendizza, and S. M. Arnold. *Corrosion*. (Technical Section), v. 7, Oct. 1951, p. 327-334.

Growths found on metal surfaces of some of the parts used in telephone communications equipment, particularly on parts shielded from free circulation of air. Mechanism of growth of the whiskers, found not only on Cd-plated parts but also on other metals. Approximately 1000 test specimens of different metals, solid and plated, were exposed under various conditions. Effects of humidity and presence of various organic materials, different film thicknesses and methods of application, surface preparation and supplementary treatments, chemical and physical properties, and X-ray studies of structure. (R general, Ti)

423-R. Effect of Specimen Shape on Corrosion in the Atmosphere. H. R. Copson. *Corrosion*, (Technical Section), v. 7, Oct. 1951, p. 335-338.

It is axiomatic that corrosion rate increases with amount of contamination actually coming in contact with the specimen. This is controlled not only by shape and form of pollution present, but also by shape and form of the specimen. While this seems obvious it has generally been overlooked in the published literature. Illustrations. Compares plain and threaded bars; wire and sheet specimens; insect screen. Various metals and alloys are involved. 10 ref. (R11)

424-R. Passivating Characteristics of the Stainless Steels. W. G. Renshaw and J. A. Ferree. *Corrosion* (Technical Section), v. 7, Oct. 1951, p. 353-360.

Investigation indicates that the rate of film growth and the "degree of passivity" attained vary considerably under different conditions. Solution potential measurements offer a convenient means of following the progress of film formation. Data show the behavior of stainless steel specimens in various solutions and in air after a prior chemical activation. A comparison of several stainless steel types in regard to their passivating characteristics, and effect of surface finish. 11 ref. (R10, SS)

425-R. Corrosion Resistance of Alloys in Amine Gas Treating Systems. F. C. Riesenfeld and C. L. Blohm. *Petroleum Refiner*, v. 30, Oct. 1951, p. 107-115.

Previously abstracted from *American Society of Mechanical Engineers*. See item 42-R, 1951. (R9, R5, Al, Ni, AY, CN, SS)

426-R. Analyses of Some Corrosion Problems in Petroleum Refineries. John F. Mason, Jr. *Petroleum Refiner*, v. 30, Oct. 1951, p. 124-131.

Fifteen case records of actual corrosion problems, which concern the initial use of carbon steel for various equipment items and their premature failure for one reason or another. Among the services involved are gas oil, depropanized naphtha, crude oil, spent H_2SO_4 alkylate, naphthenic base crudes, caustic soda and sodium plumbite, furfural, reduced crude vapors, and cracked propane distillate. (R7)

427-R. Corrosion Data of Welded Low-Carbon Stainless Steel. H. F. Ebling and M. A. Scheil. *Welding Journal*, v. 30, Oct. 1951, p. 511s-518s.

Corrosion resistances of welded, heat treated alloys and weld deposits of the unstabilized low-carbon Type 304 (18-8) were determined and compared to those of the stabilized grades of 18-8 alloys containing Cb, Cb-Ta or Ti. Corrosion resistance was based on the standard boiling HNO_3 test. 10 ref. (R5, SS)

S

INSPECTION AND CONTROL

399-S. The High-Purity Revolution in Analytical Chemistry. Sydney Abbey. *Canadian Mining and Metallurgical Bulletin*, v. 44, Sept. 1951, p. 576-579; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 354-357.

The growing interest in high-purity metals involves as much application of optics, electricity, and others branches of physics as it does of analytical chemistry. 29 ref. (S11)

400-S. Evaluation of Soundness in Cast Iron; Report and Recommendations of Sub-Comimttee T. S. 20 of the I. B. F. Technical Council. A. Tipper, chairman. *Foundry Trade Journal*, v. 91, Aug. 23, 1951, p. 211-219. Aug. 30, 1951, p. 253-260; Sept. 6, 1951, p. 283-289; disc., p. 289-291.

Limitations of radiographic and ultrasonic methods of revealing unsoundness when applied to cast iron are investigated. Results obtained by both destructive and nondestructive testing methods are compared. Other possible means of detecting unsoundness in cast iron. Results of tests and factors influencing the quantitative estimation of unsoundness in cast iron. (S13, CI)

401-S. Cold Metal and Basic Foundry Practice. III. *Industrial Heating*, v. 18, Sept. 1951, p. 1604, 1606, 1608, 1610, 1680.

Discusses the control of liquid steel temperatures in hearth and ladle presented by F. A. Von Gruenigen and W. D. Lawther at the 33rd National Open Hearth Conference of AIME. See item 73-S, 1951. (S16, D2, D9, ST)

402-S. Thermometry. M. F. Behar. "The Handbook of Measurement and Control," *Instruments Publishing Co.*, (Pittsburgh) 1951, p. 82-97.

Consists of five parts covering foundations of temperature measurement, mercury in glass thermometers, solid expansion thermometers, pressure-spring or filled-system thermometers, and resistance thermometers. Diagrams. (S16)

403-S. Pyrometry. M. F. Behar. "The Handbook of Measurement and Control", *Instruments Publishing Co.*, (Pittsburgh), 1951, p. 107-120.
Includes thermo-electric pyrometry, total-radiation pyrometry, visual optical pyrometry and autometric pyrometry. Charts and diagrams. (S16)

404-S. Automatic Control of Temperature. P. R. Ewald. "The Handbook of Measurement and Control," *Instruments Publishing Co.* (Pittsburgh), 1951, p. 123-126.
Examples of processes with various characteristics. (S16)

405-S. Dimensional Gaging and Inspection. Roger L. Geer. "The Handbook of Measurement and Control," *Instruments Publishing Co.* (Pittsburgh), 1951, p. 234-240.
Methods, techniques and apparatus. (S14)

406-S. Electric Resistance Thermometers. R. H. Warring. *Machinery Lloyd* (Overseas Ed.), v. 23, Sept. 1, 1951, p. 81, 83-84.
A survey. Diagrams of a typical potentiometer circuit are given. (S16)

407-S. New Developments in Xeroradiography. Robert C. McMaster. *Non-Destructive Testing,* v. 10, Summer 1951, p. 8-25.
Xeroradiography is a further development in the field of xerography, a dry photographic process invented by Chester F. Carlson and developed at Battelle Memorial Institute. Basic steps in the xeroradiographic process and fundamental principles. Results of practical tests. The technique is useful for examination of internal structure of a wide variety of metallic and nonmetallic materials and assemblies. (S13)

408-S. Iridium 192 for Gamma Ray Radiography. Adair Morrison. *Non-Destructive Testing,* v. 10, Summer 1951, p. 26-28.
Results of experiments are charted and discussed. (S13)

409-S. Intensification of Underexposed Industrial Radiographs. G. M. Corney and H. R. Splettstosser. *Non-Destructive Testing,* v. 10, Summer 1951, p. 29-32.
In many cases, underexposed industrial radiographs can be salvaged by treatment with Kodak Intensifier In-6. Intensification, which follows normal processing, may be carried on in full room light, and, if done immediately after fixation, adds less than half an hour to normal processing time. Typical results are tabulated, charted, and illustrated. (S13)

410-S. Some Aspects of Cobalt Radiography. D. T. O'Connor and J. J. Hirschfield. *Non-Destructive Testing,* v. 10, Summer 1951, p. 33-39.
Problem of scattered radiation in gamma radiography. Elements controlling definition and sensitivity. A simple technique has been developed which permits minimum focal film distance for optimum sensitivity to be predetermined. A combined sensitivity-technique chart is recommended which makes possible selection of a technique to produce the desired result with respect to exposure-time range of absorber thickness and plate sensitivity. 13 ref. (S13)

411-S. Rupture by Bending of Certain Shafts and Axles. (In French). Jean Peltier. *Métallurgie et la Construction Mécanique,* v. 83, Aug. 1951, p. 591-593.
Short theoretical study, aiming to explain the rupture of pieces with an insufficient safety margin. (S21, Q26)

412-S. Recent Progress in Flash Radiography. J. C. Clark. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 3-9.
The use of the Westinghouse Micronex X-ray equipment for research problems involving material motions for 2500 to 25,000 ft. per sec. is illustrated by selected flash radiographs. A circuit is described which, when used with a Micronex X-ray tube, will produce single X-ray pulses lasting no longer than 1/10 microsecond. (S13)

413-S. 10-Mev. X-Ray Technique. D. T. O'Connor, E. L. Criscuolo, and A. L. Pace. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 10-19; disc., p. 19.
Data on beam intensity distribution, lead screen efficiency, absorption of radiation by steel plate, and penetrameter sensitivity. Ionization shield thickness data is given as a check on the validity of the radiographic results. (S13, ST)

414-S. Radiography and Autoradiography by Photoelectrons. D. T. O'Connor and W. R. Maddy. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 20-33.
Two separate techniques for the examination of microstructures. The first deals with the absorption of photo-electrons generated from Pb sheet by X-rays in thin slices or films of material. The second technique depends on the difference in the efficiency of photo-electron production by materials of different atomic number. Graphs and photo-electron radiographs. 11 ref. (S13, M23)

415-S. Mobilizing the Van De Graaf Generator for Precision Radiography. E. Alfred Burrill. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 34-39; disc., p. 39-40.
The Van de Graaf 2-million-volt generator has been developed for nondestructive testing of bulky, immovable objects. New techniques in high-voltage X-ray tube construction, improvements in electrical designs, simplified controls, and auxiliary equipment have all contributed to the ultimate compactness of this type of X-ray source. (S13)

416-S. A Universal Exposure Calculator for Radium Radiography and Its Application to Current Radiographic Films and Techniques. Noah A. Kahn, Emil A. Imbembo and Jay Bland. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 41-59.
Standardized exposure calculator is used in connection with steel and other materials and with all types of industrial radiographic film, or with radiographic techniques which aim at image density levels higher or lower than the normal net density of 1.00. Method of determining the film speed rating factors and data on the speed rating factors of a number of commercial types of radiographic film. 12 ref. (S13, ST)

417-S. A Discussion on Radiographic Sensitivity. Carlton H. Hastings. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 60-68; disc., p. 68-69.
Radiographic sensitivity, radiographic definition, and radiographic contrast are defined and discussed. (S13)

418-S. A Revised Procedure for Establishing Radiographic Standards. Leslie W. Ball. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 70-74; disc., p. 74.
Recommendations and discussion. (S13)

419-S. An Investigation of Radiography in the Range From 0.5 to 2.5 Million Volts. W. W. Buechner, R. J. Van de Graaff, H. Feshbach, E. A. Burrill, A. Sperduto, and L. R. McIntosh. *American Society for Testing Materials,* "Papers on Radiography," 1949, p. 75-95.
Production, absorption, and scattering of high-voltage X-rays, application of high-voltage X-rays to radiography, and technique of high-voltage radiography. (S13, ST)

420-S. How to Choose Equipment for Nondestructive Testing. Carlton H. Hastings. *Canadian Metals,* v. 14, Sept. 1951, p. 20-24, 26-27.
Previously abstracted from *American Foundrymen's Society.* Preprint 51-15, Apr. 1951. See item 206-S, 1951. (S13)

421-S. New Testing Methods. *Canadian Metals,* v. 14, Sept. 1951, p. 46.
Methods such as optical projection, supersonics, failure forecasting, gaging devices, and mechanical "brains" in the metal industry. (S13, S14)

422-S. Atomic By-Products for the Foundry. Thomas A. Dickinson. *Foundry,* v. 79, Oct. 1951, p. 188, 191-192, 194.
Use of radioisotopes in the development of new casting alloys, to prepare and to maintain the quality of existing casting alloys to facilitate the cleaning and inspection of castings, and to lead to development of new and useful cast alloy products. Other applications. 16 ref. (S19, E general)

423-S. Another Inspection Method for Quality Control. *Industry & Welding,* v. 24, Oct. 1951, p. 43-44, 47.
A portable magnetic inspection unit for detecting cracks and fractures in ferrous metal parts. Applications. (S13, Fe)

424-S. Nonferrous Alloy Specifications. Norman E. Woldman. *Iron Age,* v. 168, Oct. 4, 1951, p. 240-244, 249-255. (Condensed from the 1949-1950 Supplement of the ASTM).
Detailed tables of all specifications for nonferrous structural metals, their common uses and their equivalents in other specifications. (S22, EG-a)

425-S. Determination of Hydrogen in Liquid Steel. R. M. Cook and J. D. Hobson. *Journal of the Iron and Steel Institute,* v. 169, Sept. 1951, p. 24-25.
A comparison between two methods is given as a result of collaborative work between two laboratories. The methods employ a sealed mold and a quenched notched pencil. Results are given for 15 casts made by acid and basic openhearth, and basic electric-arc processes. Satisfactory agreement is shown for comparative results obtained by two methods. (S11, ST)

426-S. Rapid Analysis Methods in Steelmaking. L. H. Arner and H. H. Johnson. *Journal of Metals,* v. 3, Oct. 1951, p. 858-859.
Methods for the determination of C, S and P. (S11, ST)

427-S. Bearing Down on Quality. A. V. Toth. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 60-61, 194, 196, 198, 206-207.
Cleveland Graphite Bronze Co. reports its effective use of statistical quality control methods, and its products. (S12)

428-S. Ford Indicates the Way to Quality. Roscoe M. Smith. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 62-63, 96, 108, 209.
Indicating-type gages used by the Ford Motor Co. to inspect the parts for quality conformance. (S13)

429-S. Profitable Experiences in Quality Control. Leo Harrington. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 64-65, 200, 204, 212, 216.

The use of quality control resulted in better and more uniform products at less cost at the King-Seeley Corp., Ann Arbor, Mich. (S12)

430-S. Gears of Exceptional Quality. H. S. Gist. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 66-67, 74, 78.

Recent developments at the Nash-Kelvinator Corp. made possible by its quality control programs. The quality control methods, coupled with new cutting tools, have made it possible to produce transmissions of exceptional quality. (S12)

431-S. High Speed Photography Applied to Production Quality. J. H. Waddell. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 76, 80, 84, 202, 210, 214.

Use by some industries in quality control. (S13, S12)

432-S. Air Force Quality Control Requirements. O. C. Griffith, Jr. *Magazine of Tooling and Production,* v. 17, Oct. 1951, p. 82, 86, 184-190.

Progressive approach of the Air Force toward government inspection and quality control. Air Force contractors are required to conduct sufficient inspection at all stages, from material receipt and to packaging of the end item, to assure that all contractual requirements are complied with. (S12, S general)

433-S. Chemical Spot Tests for Nickel and Molybdenum. Elmer H. Snyder and Arthur H. Klein. *Metal Progress,* v. 60, Sept. 1951, p. 78-79.

Experiences in identification of carbon and low-alloy steels containing small amounts of Ni and Mo. It was found that scaled and shot-blasted surfaces may give erroneously high indications because of diffusion. Spot-test solutions and procedures. (S10, CN, AY)

434-S. Short-Range Radiography for Weld Inspection. Ernest H. S. van Someren. *Welder,* v. 20, Jan.-June, 1951, p. 10-11.

Tests were carried out on the effect of working distance between X-ray tube and film. (S13)

435-S. Arc Spectra Between Aluminum Electrodes in Air and in Hydrogen. (In French.) Raymond Ricard and Alexis Dufour. *Comtes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, July 30, 1951, p. 370-372.

Shows that this method of testing for impurities in commercial Al gives better results than the ordinary methods employed. (S13, Al)

436-S. Application of 1, 10-Phenanthroline to the Spectrophotometric Determination of Copper in Ores. J. P. Mehlig and P. M. Gruzensky. *Chemist Analyst,* v. 40, Sept. 1951, p. 52-56. (S11, Cu)

437-S. Winding Ropes—Safety and Control. A. E. McClelland. *Colliery Guardian* (Overseas Supplement), Summer 1951, p. 21-27.

Various types of deterioration and possible failure of wire rope, including those caused by corrosion, fatigue, wear, and their combinations. (S21, Q7, Q9, R general, ST)

438-S. Direct Reading Spectroscopy Speeds Aluminum Production. J. R. Churchill.. *Iron Age,* v. 168, Oct. 11, 1951, p. 97-100.

High-speed analysis of Al alloys on direct-reading quantometers has cut waiting time of Alcoa's holding hearths to a minimum. Of 7 million determinations made each year, 60% are already being made by this method. A complete report may be obtained in 4 min. or less. (S11, Al)

439-S. How to Interpret Radiographs of Pipe-Line Welding Defects. A. G. Barkow. *Oil and Gas Journal,* v. 50, Oct. 4, 1951, p. 177-180, 183, 186, 268-269, 271.

The more common defects both as found by radiographic inspection and actual examination of a cross-section of the specimen. (S13)

440-S. New Methods for Non-Destructive Inspection. Thomas A. Dickinson. *Welding Engineer,* v. 36, Oct. 1951, p. 56-58.

Old and new test methods, such as radioactive isotopes, painting the flaws, and xerographic radiography. (S13)

441-S. Nondestructive Materials Testing. (In French and German.) Hch. Zoller. *Pro-Metal,* v. 4, Aug. 1951, p. 871-877.

Use of γ-rays and ultrasonics in materials testing. The two most widely used methods of generating ultrasonics, also the ray-penetration process, the Echolot testing method, and the sono-optical process. (S13)

442-S. Magnetic-Particle Testing. (In Swedish.) Paul Bjornson, Klas Erik Johansson, and Per Stake. *Jernkontorets Annaler,* v. 135, no. 4, 1951, p. 129-168.

Magnetic particle method of detecting cracks, inclusions and other defects in ferromagnetic materials such as malleable and cast iron, and steel. Principles, equipment, and applications of the method. 50 ref. (S13, CI, ST)

443-S. Apparatus for Determining Hydrogen in Steel. (In Swedish.) Kurt Amberg and Stig Kämpinge. *Jernkontorets Annaler,* v. 135, no. 5, 1951, p. 177-185.

Apparatus which utilizes hot extraction at 700° C. The accuracy of the determination is sufficient from a practical point of view. The largest errors are due to losses of H_2 before the analysis is made. These errors may be reduced by means of rapid cooling of the test piece and storing the sample at a low temperature. (S11, ST)

444-S. (Pamphlet) **Report on Standard Samples for Spectrochemical Analysis.** C. H. Corliss, chairman. 31 pages, 1950. 1916 Race St., Philadelphia 3, Pa. (Technical Publication 58B.) $1.25.

The report is divided into sections representing related groups of materials for which extensive applications of spectrographic analysis were made. Status of standards in each group of materials. Those available, forms of the samples, the intended uses, and typical compositions. Included are: Fe and steel, Al and its alloys, Mg and its alloys, Zn, Pb, and Sn alloys, and Cu alloys; as well as a miscellaneous group of samples. (S11)

445-S. (Book) **The Handbook of Measurement and Control.** M. F. Behar, editor. 291 pages. 1951. Instruments Publishing Co., Inc., 921 Ridge Ave., Pittsburgh 12, Pa. Free to new subscribers to *Instruments* ($4.00 per year).

Designed to bring classifications, operating factors, and typical applications of instruments to users, manufacturers, and students. Includes all indicating, recording, integrating, controlling, and computing devices used in measurement, inspection, testing and control applications. Laboratory, scientific, engineering and industrial instruments are included. All basic methods and mechanisms are covered, including pneumatic, hydraulic, electric, and electronic instruments. The emphasis is on practical factors. Terminology is considered carefully. (S general)

446-S. (Book) **Papers on Radiography.** 95 pages, 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. (Special Technical Publication 96.) $1.75.

Development and progress in radiographic techniques and apparatus. Applications. Each paper is abstracted separately. (S13, ST)

T APPLICATIONS OF METALS IN EQUIPMENT

405-T. Progress in Polymetallic Lithographic Plates. Herbert R. Leady. *American Paper Converter,* v. 25, Sept. 1951, p. 10-11, 40-41.

A review of the basic elements in some of the better-known processes in which two or more metals are combined in the same plate. (T9)

406-T. The "Rivaloy" All-Metal Body. *Automobile Engineer,* v. 41, Sept. 1951, p. 337-339.

Describes, diagrams, and illustrates bus bodies produced by a British firm. Steel members and Al-alloy members and sheets are used. (T21, ST, Al)

407-T. Tungsten Carbide Drilling at the Sullivan Mine. J. W. Reynolds. *Canadian Mining and Metallurgical Bulletin,* v. 44, Sept. 1951, p. 630-635.

Methods of testing and comparing performance and costs. (T28, C-n, W)

408-T. New Constructional Material; Silver Now Being Used for Chemical Plant. *Chemical Age,* v. 65, Sept. 8, 1951, p. 331.

Utilization of Ag as lining on a base metal of high strength. A silver-lined mild steel reaction vessel which is corrosion resistant is illustrated. Table gives corrosion resistances of chemically pure Ag to a series of common chemicals at temperatures from room to 350° C. (T29, R general, Ag)

409-T. Hard Facing Alloys for Steel Mill Use. Howard S. Avery. *Iron and Steel Engineer,* v. 28, Sept. 1951, p. 81-106; disc., p. 106.

Types of alloys and some of their properties. Suggests how materials can be selected by using judgment based on an analysis of service factors. Tables, diagrams, graphs, and photomicrographs. 16 ref. (T5, L24, AY, SG-j)

410-T. Packaging in Metallic Foil. W. A. Harrington. *Light Metals,* v. 14, Sept. 1951, p. 503-508.

The latest developments in coated and laminated metallic foils, particularly those with plastic coatings, and actual or potential uses of interest. Reference is also made to printing. (T10, Al, Sn)

411-T. Light Alloy in Road Transport. W. Metcalf. *Light Metals,* v. 14, Sept. 1951, p. 510-517.

Application of wrought and cast aluminium in private cars and vehicles for commercial and public transport purposes. Engineering, structural and decorative uses are considered. Briefly contrasts the exterior use of aluminum on some foreign models, with the tendency of present British practice to rely, wherever possible and permissible, upon chromium. (T21, Al)

412-T. Non-Ferrous Metals and Alloys in Marine Engineering. William McLaughlin. *Metal Industry,* v. 79, Aug. 31, 1951, p. 163-166; Sept. 7, 1951, p. 201-203; Sept. 14, 1951, p. 224-225.

Properties of the various types, their suitability for different marine-engineering applications, especially those involving high pressures and temperatures, and corrosive media. Second part deals with Cu, brasses and bronzes. Last part deals with

Al and its alloys, and requirements for bearing materials.
(T22, Cu, Al, SG-h, EG-a)

413-T. "Composite Plating"; A New System of Marine Construction in Aluminium-Alloys. *Metal Industry,* v. 79, Aug. 31, 1951, p. 166.
New system of light-alloy construction known as "composite plating" utilizes extrusions for framing. Where traditional construction methods are employed, a vessel made of Al alloy will cost more than one made of steel. The system exploits all the manipulative advantages which Al has over steel, and by so doing simplifies assembly and reduces waste. (T22, Al)

414-T. Marine Propellers. G. T. Callis. *Metal Industry,* v. 79, Aug. 31, 1951, p. 167-170.
Properties and compositions of the various Mn bronzes in current use for marine propellers. Use of Al bronzes. Casting procedures and typical microstructures. Corrosion and erosion resistances.
(T22, Q general, R general, Cu)

415-T. Light Metals in Automobiles. F. L. Church. *Modern Metals,* v. 7, Sept. 1951, p. 23-24, 27-28, 31, 33-34, 36.
Reviews the history of light metals in autos, describes some significant developments both here and abroad, and comments briefly on the outlook. (T21, Al)

416-T. Aluminum Aircraft Hangars. *Modern Metals,* v. 7, Sept. 1951, p. 41-42.
Construction by a British firm.
(T26, Al)

417-T. Magnesium Bookkeeping Equipment. *Modern Metals,* v. 7, Sept. 1951, p. 44.
Development by LeFebure Corp. Mg was chosen because of its high strength-to-weight ratio. (T10, Mg)

418-T. Die Cast Aluminum Casement Windows. *Modern Metals,* v. 7, Sept. 1951, p. 51-53.
Advantages of the die-casting process over conventional extruded Al and rolled steel construction.
(T26, E13, Al)

419-T. Stainless Steel Lining of a Pulp Mill Digester. S. C. Johnson and N. J. Gibson. *Paper Trade Journal,* v. 133, Sept. 14, 1951, p. 20, 22-24, 26-27.
Lengths of strip stainless steel 4 in. wide were welded to the inside surfaces of a pulp-mill digester. Corrosion tests were made before and after the lining process.
(T29, R11, L22, SS)

420-T. Aluminum Offers Design Advantages for Refrigeration Equipment. E. W. Mason. *Refrigerating Engineering,* v. 59, Sept. 1951, p. 869-872, 910-912.
Recommended practice notes that may be of interest to designers, operators, and of service when dealing with systems incorporating Al parts.
(T27, Al)

421-T. Instrument Springs and Spring Instruments. J. W. Rockeffer, Jr. *Wire and Wire Products,* v. 26, Sept. 1951, p. 764-765, 802-807.
The properties required in springs to make them suitable for precision-instrument applications. Properties and applications of different spring alloys. (T7, Q general, SG-b)

422-T. Reclaiming of Heat in Metallurgical Furnaces. (In French.) *Métallurgie et la Construction Mécanique,* v. 83, Aug. 1951, p. 595-597.
Various set-ups for the above purpose. (T5)

423-T. Modern Trends in Lithography. Paul J. Hartsuch. *Canadian Printer and Publisher,* v. 60, Sept. 1951, p. 38-39, 47.
New materials, equipment, and methods used in the lithographic industry, litho platemaking, dry offset plates, iron-coated plates, paper wraps for damp rollers, and litho ink. (T29)

424-T. Powdered Metals in Electrical Contacts. R. K. Beggs. *Journal of Metals,* v. 3, Oct. 1951, p. 860-863.
Contacts made by powder-metallurgy techniques are generally metallic compounds or mixtures rather than alloys. They may include controlled percentages of oxides, borides, nitrides, etc. They may be combinations of metals which will not alloy or are difficult to alloy in the percentages desired, such as Ag and Ni, or Pt and W. They may be made of metals that will alloy, but where the resulting alloy is so hard and brittle it cannot be worked, such as Pt and Os, or Ag and Ge. Physical properties of materials are tabulated. (T1, H general)

425-T. Materials Engineering Plays Important Role in Development of P & W Jet Engines. *Materials & Methods,* v. 34, Oct. 1951, p. 85-87.
Illustrations and outlines are included for selecting engineering materials and selecting methods to process the materials. (T25)

426-T. Copper-Base Die Castings Now More Widely Used. Ben Johnson and Sidney E. Gregory. *Materials & Methods,* v. 34, Oct. 1951, p. 92-94.
Recognized advantages include close tolerances, elimination of machining, good surface finish, high production rates, and good physical properties. (T general, E13, Cu)

427-T. Titanium in Aircraft. J. B. Johnson and E. J. Hassell. *Metal Progress,* v. 60, Sept. 1951, p. 51-55.
Possibility of wide application. New research developments. Comparative mechanical properties of a series of aircraft structural metals and of three forms of Ti at 70, 300, and 700° F. are tabulated and charted. (T24, Q general, Ti)

428-T. Caterpillar's Experience with Boron Steels. *Metal Progress,* v. 60, Sept. 1951, p. 66-68.
Specific details of alloys used for given parts, mechanical-property specifications, and total tonnages used of the different alloys.
(T21, Q general, AY)

429-T. Gas-Turbine Materials. *Metal Progress,* v. 60, Sept. 1951, p. 124, 126, 128, 129. (Condensed from "Gas-Turbine Performance and Materials," J. B. Bucher.)
Previously abstracted from "Symposium on High-Temperature Steels and Alloys for Gas Turbines," *Iron and Steel Institute,* Feb. 1951. See item 354-T, 1951.
(T25, Q3, K9, R9, SG-h)

430-T. Turbine Materials and Performance. *Metal Progress,* v. 60, Sept. 1951, p. 138. (Condensed from "Materials and Performance," A. T. Bowden and W. Hryniszak.)
Previously abstracted from "Symposium on High-Temperature Steels and Alloys for Gas Turbines," *Iron and Steel Institute,* Feb. 1951. See item 353-T, 1951.
(T25, Q general, SG-h, AY)

431-T. Use of Aluminum in Petroleum Refinery Equipment. E. E. Kerns and W. E. Baker. *Proceedings, Sixteenth Mid-Year Meeting, Division of Refining, American Petroleum Institute,* v. 31M (III), 1951, p. 89-98; disc., p. 98.
Previously abstracted from *Oil and Gas Journal.* See item 246-T, 1951.
(T29, Al)

432-T. Helical Inserts; They Strengthen Threads in Aluminum Castings. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 81.
Use in solving a problem of stripped threads in automatic stapling machines. The inserts are stainless steel. (T7, SS, Al)

433-T. New Alloy Steel; First Tangible Results of Alloy Research for Steels for the Automotive Industry in Southern California. J. S. C. Wells. *Western Machinery and Steel World,* v. 42, Sept. 1951, p. 87.
New Cr-Mo-V spring steel developed under the direction of Edgar Brooker, for U. S. Spring & Bumper Co. is called Rauenloy. Applications in leaf springs. (T7, AY)

434-T. Five Tons of Magnesium in B-36 Airframe. *Automotive Industries,* v. 105, Oct. 3, 1951, p. 52.
Diagram shows components made of Mg and its alloys. (T24, Mg)

435-T. Aluminum Radiators to Save Copper. *Business Week,* Oct. 13, 1951, p. 52-54, 56.
Production methods. Other industrial applications of Al. (T27, Al)

436-T. Manufacture of a High-Frequency Transmitting Tube. *Electrical Communication,* v. 28, Sept. 1951, p. 171-185.
A picture story of the manufacture of a high-frequency transmitting tube, F-5918 triode. Includes the various machining operations.
(T1, G17)

437-T. Powder Metal Gears in Electrical Appliances. *Electrical Manufacturing,* v. 48, Oct. 1951, p. 143-145, 318, 320.
How use of Cu-impregnation process and of Cu-Fe alloys increases the number of applications for powdered metal parts in products such as washers, fans, and food mixers.
(T10, H16, Cu, Fe)

438-T. Piping Materials for Chemical Processes. Carl B. McLaughlin. *Heating Piping & Air Conditioning,* v. 23, Oct. 1951, p. 85-94.
Material and other piping requirements for chemical process use. Data are tabulated and charted relative to nominal wall thickness, maximum allowable temperatures and pressures for pipe of various materials. Effects of different fabrication procedures. (T29)

439-T. Designing Aircraft Main Spar Frames. Melvin Stone. *Machine Design,* v. 23, Oct. 1951, p. 111-116.
Selection of materials and fabrication methods. Properties of various Al alloys used. (T24, Al)

440-T. Cast-Weld Design. *Machine Design,* v. 23, Oct. 1951, p. 137-140.
Said to be the key to low-cost steel casting having greater precision and serviceability. Instead of using integral steel castings or structures built up of a number of pieces of rolled steel, in numerous instances manufacturers are producing parts composed of several steel castings, or a combination of steel castings and rolled steel shapes or plate, united by welding. (T26, CI)

441-T. Powder-Metal Gears. D. W. Lynch, T. J. Snodgrass, and T. T. Woodson. *Machine Design,* v. 23, Oct. 1951, p. 146, 184-186, 188, 190. (A condensation.)
Fabrication, properties and applications of gears made for use in General Electric appliances.
(T7, H general)

442-T. Designing with Modern Materials. *Machine Design,* v. 23, Oct. 1951, p. 297-350.
A comprehensive survey of the latest developments in engineering materials. Sections cover ferrous metals, Al and alloys, Mg and alloys, rare-earth alloys, Cu and alloys, Ti and alloys, Mo and alloys, W and alloys, heat and corrosion resistant alloys, cemented carbides, powdered metals, ceramics and refractory materials, plastics, rubbers, finishes, insulations, and lubricants.
(T general)

443-T. Condensed Review of Some Recently Developed Materials Arranged Alphabetically by Trade Names. *Machinery* (American), v. 58, Oct. 1951, p. 159-172.

Includes properties and applications. (T general, Q general)

444-T. The Manufacture of Springs. M. J. Sargeaunt, M. A. Hons. *Machinery Lloyd* (Overseas Ed.) v. 23, Sept. 25, 1951, p. 77, 79, 81, 81-85.

The town of Redditch in England is famous for the manufacture of the smaller types of springs. Some of the methods and equipment used. (T7)

445-T. Composite Plating; a New Method of Light Alloy Barge Construction. *Metallurgia,* v. 44, Sept. 1951, p. 143-144.

Method introduced by a British firm utilizes the fact that intricate shapes in Al alloys which cannot be rolled may be extruded satisfactorily. The barge is built entirely of such extrusions, except for hatch covers. (T22, G general, Al)

446-T. How to Tackle Materials Substitution. *Product Engineering,* v. 22, Oct. 1951, p. 123-130.

Considerations in selecting a substitute material; nine suggestions as to how to set up a material program, a table of substitute alloys, carbon, and free-machining steels, and case studies of materials substitutions. (T general, SG-k, AY, CN)

447-T. Steel Users Must Conserve Alloying Elements. *Product Engineering,* v. 22, Oct. 1951, p. 131-133.

The following suggestions are made to help conserve alloying elements: the use of leaner alloy steels; the replacement of alloy steels with carbon steels through revised heat treatment practice; the use of materials other than steel which are in more abundant supply; new methods of fabrication which require less metal; and the use of boron steels. (T general, AY, ST)

448-T. Aluminum Output Improves. *Product Engineering,* v. 22, Oct. 1951, p. 138-139.

Recent technical developments and prospective fields of application. (T general, A4, Al)

449-T. Magnesium Confined to Military Applications. *Product Engineering,* v. 22, Oct. 1951, p. 140-141.

The trend of using Mg alloys rather than pure Mg. Comparative properties of several Mg-Li base alloys as well as a few tension-compression stress-strain curves of alloys under consideration. (T2, P general, Q general, Mg)

450-T. Copper. *Product Engineering,* v. 22, Oct. 1951, p. 144.

The increasing demand for Cu and the problem of substituting for it. (T general, Cu)

451-T. Briefs on Other Materials. *Product Engineering,* v. 22, Oct. 1951, p. 145-146.

Pb, Sn, Ni, Mo, Zn, clad metals, and synthetic rubbers. Includes availability of metals, metal alloys, and application. (T general, A4, EG-a)

452-T. Metal Refractory Alloys. *Product Engineering,* v. 22, Oct. 1951, p. 147-150.

The use of metal-ceramic alloys has widened the field of high-temperature materials. Summation of their properties and some of the limitations. Fabrication of parts is presently limited to powder metallurgical processes. (T general, H general)

453-T. (Pamphlet) The Role of Nickel in the Machine Tool Industry. William Mounce and J. E. Fifield. 1950, 30 pages. International Nickel Co., 67 Wall St., New York 5, N. Y.

Contains information for use in the selection and specific application of Ni-containing materials by the machine-tool industry. (T5, Ni, AY, CI)

454-T. (Book) Aircraft Materials and Processes. George F. Titterton. Ed. 4, 1951. 259 pages. Pitman Publishing Corp., 2 West 45th St., New York 19, N. Y.

Metallic and nonmetallic materials and processes used in the construction of aircraft. Testing and inspection procedures, properties and compositions of miscellaneous ferrous and nonferrous metals and alloys, heat treatment, surface hardening, joining, corrosion and its prevention, plastics, wood, fabrics, adhesives, rubbers, glass, etc. Final chapter covers selection of materials for specific applications. (T24)

V

MATERIALS
General Coverage of Specific Materials

140-V. Metallurgy in Tool Design and Production. E. D. Wiard. *Machinery* (American), v. 58, Sept. 1951, p. 144-148.

Surveys information necessary for an understanding of tool material applications. Compositions of the high speed steels most commonly used for cutting tools and physical properties of these steels are tabulated. Emphasizes effects of heat-treatment variables. (TS)

141-V. Tin and Tungsten—Their Past, Present and Future. Charles A. Scarlott. *Materials & Methods,* v. 34, Sept. 1951, p. 69-73.

Sources, reserves, price fluctuations, natural forms, and applications of two scarce and strategically important metals. (A4, B10, T general, Sn, W)

142-V. The Wrought Phosphor Bronzes. John L. Everhart. *Materials & Methods,* v. 34, Sept. 1951, p. 97-112.

Special report covers standard grades and available forms; engineering properties; forming and fabricating; joining practice; surface finishing; and applications. (Cu)

143-V. Ductile Zirconium Metal—Its Production and Properties. G. L. Miller. *Times Review of Industry,* v. 5, Sept. 1951, p. 29-30.

Previously abstracted from *Metallurgia.* See item 85-V, 1951. (Zr)

144-V. Spotlight on Zirconium. *Chemical Week,* v. 69, Oct. 6, 1951, p. 27-28.

Present outlook for Zr. Properties that make it a superior material of construction. (Zr)

145-V. Malleable Iron: Then and Now. James H. Lansing. *Foundry,* v. 79, Oct. 1951, p. 92-97, 267-268.

Development of malleable iron castings from their earliest application for harness hardware and wagon parts to their widespread use today. (CI)

146-V. Suggested Emergency Steel Alternates for Some Standard Alloy Grades. *Iron Age,* v. 168, Oct. 4, 1951, p. 239.

Suggestions in tabular form with cautions as to use. (AY)

147-V. New Steel Compositions to Conserve Critical Alloying Elements. *Materials & Methods,* v. 34, Oct. 1951, p. 135, 137.

The new grades of steel developed to conserve Mn, Ni, Cr and Mo are tabulated and their compositions. shown. (AY, ST)

(Continued on page 50)

STATEMENT OF THE OWNERSHIP, MANAGEMENT AND CIRCULATION, REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933 AND JULY 2, 1946 (39 U. S. C. 233), OF METALS REVIEW

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Marjorie R. Hyslop, Editor

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METALLURGIST: Recent graduate trained in physical metallurgy, for an opening in research laboratory of large manufacturer of alloy, tool, and stainless steels. Excellent opportunity for professional development. In reply provide usual details including draft status and salary expected. Box 11-5.

SHOP EXECUTIVE: For large heat treating plant with great variety of work. Mature man with broad background of experience and sound metallurgical training. Capable of planning work, supervising operations, maintaining rigid quality standards, and getting maximum output. Requires initiative, energy, resourcefulness. Outstanding opportunity for man who can prove ability. State qualifications fully, starting salary expected. Box 11-10.

METALLURGIST: Unusual opportunity to work in powder metallurgy field with outstanding company. Work will be connected with development of new high-temperature metals by means of powder metallurgy technique. Most of work in metallographic laboratory. Salary dependent on background and experience. Applicants with one to five years experience considered. Box 11-15.

METALLURGIST: Recent graduate with one to two years experience in material inspection and heat treating. Complete control of material selection and heat treating processes necessary to produce high grade closely machined parts. State age, education, experience, and salary expected. Box 11-20.

SUPERVISORY METALLURGIST: Preferably 30 to 40 years old with experience in high production ferrous heat treating. Large well-established New England plant. State age, experience and salary desired. Box 11-25.

METALLURGIST: Large manufacturer wishes to hire two men, with basic understanding of powdered metallurgy, to work in powdered metallurgy and related fields. Nature of position as well as salary determined by training and experience. Box 11-30.

PHYSICAL METALLURGIST: Opportunity for interesting fundamental research in physical metallurgy, and teaching, if desired. Attractive location, pleasant climate, month's vacation. Please give qualifications and salary expected. Box 11-35.

RESEARCH METALLURGIST: Top-notch metallurgist with graduate training required. Duties would be as project leader in fatigue studies. Experience in research required. Also metallurgist with slightly lesser qualifications is desired. Box 11-40.

METALLURGICAL ENGINEER: With knowledge of machinability, heat treatment and structure, both ferrous and nonferrous. Knowledge of metallography, able to polish and understand structure of common steel and nonferrous alloys. Able to conduct basic design studies and operate laboratory physical testing machines. Box 11-135.

Midwest

FERROUS METALLURGIST: For high-frequency melting. Ground floor opportunity in new division of established company in Western Michigan. Box 11-45.

METALLURGIST: Well established progressive manufacturing company with national sales force and outstanding record for product development prefers an active, capable man with good scholastic background in metallurgy or chemistry and experience with barrel plating, heat treating, and metallurgical laboratory work. Furnish details of education, age, marital and draft status as well as salary requirements. Box 11-50.

WELDING ENGINEER: Recent graduate engineer or metallurgist experienced in all welding processes, to head up welding laboratory to develop manufacturing processes, welding equipment and tooling for manufacturing use. Excellent opportunity with company that is a leader in the welding of high-temperature alloys. Box 11-55.

TRANSFORMER TECHNICIAN, ENGINEER AND SUPERVISOR: ELECTRICAL AND ELECTRONICS ENGINEERS: Excellent positions and good opportunities offered by old and expanding manufacturing concern. Stimulating work, congenial associates, liberal employee benefits. Box 11-60.

METALS JOINING: Excellent opening for metallurgical engineer with interest and knowledge of modern research methods in brazing, soldering, and welding. Prefer man with advanced college training, but not essential. Excellent opportunity for advancement in expanding organization. Write: Metals Dept., Armour Research Foundation, Chicago 16, Ill.

TITANIUM METALLURGIST: Excellent opening for metallurgical engineer interested in the physical metallurgy of titanium. Prefer man with advanced college training, but not essential. Some experience with other metals desirable. Excellent opportunity for advancement in expanding organization. Write: Metals Dept., Armour Research Foundation, Chicago 16, Ill.

RESEARCH METALLURGIST: Recent graduate seeking training and advancement. Physical metallurgy and structure of metals knowledge necessary. Duties encompass metallography, radiography, welding, elevated temperature evaluation, alloy development and foundry process studies. Nationally known, highly regarded midwestern industrial concern with capable top management assures advantages not generally available. Salary will interest good man. Box 11-140.

CHIEF ENGINEER: For industrial furnace manufacturer. Application and information will be held confidential. Box 11-145.

METALLURGIST: For sales and research. Industrial furnace manufacturer. Box 11-150.

METALLURGICAL ENGINEER: Excellent opening for graduate engineer with background of basic welding processes and working knowledge of metallurgy. Position in engineering laboratory of large concern in Chicago. Involves development of welding procedures and processes for ferrous and nonferrous materials. In reply state complete qualifications and salary desired. Box 11-155.

PROCESS ENGINEER, METALLURGICAL: For technical supervision and process improvement work in pilot plant engaged in melting, fabrication, and joining of special metals. Personal aggressiveness and leadership essential. Practical experience in, metal processing desirable. Location, Pittsburgh area. Box 11-65.

Canada

SALES METALLURGIST: For only Canadian producer of stainless, heat-resisting tool and specialty steels. Expanding opportunity for engineer, preferably 30 to 35 years old, with practical background in production and fabrication, particularly flat rolled stainless. Must possess mechanical ingenuity. Some traveling. Attractive salary for right man. Write stating experience and salary requirements to: J. L. Cotsworth, Atlas Steels Ltd., Welland, Ont., Canada.

POSITIONS WANTED

METALLURGICAL ENGINEER: Technical degree. Eleven years experience in specialized field of powder metallurgy in successive positions of research engineer, chief engineer in metal department, technical advisor and assistant to general manager. Desires executive responsibility in production and commercial operations. Box 11-70.

PHYSICAL METALLURGIST: Ph.D., age 31, married. Experience includes eight years research in welding and physical metallurgy, three years teaching, consulting, one year steel mill work. Desires to act as consultant on full-time research and development position. Presently employed in college teaching. Box 11-75.

METALLURGICAL ENGINEER: M.S. degree, University of Illinois. Age 31. Seven years experience in development and control, ferrous and nonferrous, involving fabrication, welding, and heat treatment. Development of heat resistant alloys and basic research on crystal imperfections. Desires position in development or production. Particulars on request. Box 11-80.

(Continued on next page)

EMPLOYMENT SERVICE BUREAU (CONT.)

METALLURGICAL ENGINEER: M.S. degree. Age 32, married, two children. Experienced in testing, heat treatment, and specification of steels (including alloy, stainless, and tool steels), aluminum, copper, magnesium and nickel alloys. Desires position as materials consultant for engineering department or sales/service engineer. New York Metropolitan area preferred. Box 11-85.

METALLURGIST: M.S. degree. Age 36, married, one child. Ten years experience in ferrous physical metallurgy. Last five years on fundamental problems in research laboratory of large steel company. Three years in laboratory development work with aircraft engine manufacturer. Two years research assistant in graduate school. Desires position in applied research and development with advancement opportunities. Prefer east. Box 11-90.

METALLURGIST: Heat treating supervisor. Capable of supervising all varieties of heat treating operations. Practical all around experience. Able to select and train operation of modern equipment. Know shop and service problems. Head metallurgical and chemical laboratory. Ten years teaching metallurgy, 18 years supervisory experience. Married, age 45. Box 11-95.

QUALITY MANAGER: Graduate metallurgist with 14 years experience in research, development and production of ferrous and refractory alloy parts. Excellent background in management. Desires position in northern New Jersey. Box 11-100.

METALLURGICAL ENGINEER: Ph.D. degree. Age 27, married, one child. Five years experience in basic research and industrial problems on both ferrous and nonferrous materials, including titanium. Three years part-time graduate research. Two years in charge of metallurgical laboratory in diversified plant, and two years part-time teaching experience overseas. Interested in responsible position involving basic research or development applied to fabricating plant problems. Prefer West Coast or Rocky Mountain area. Box 11-105.

METALLURGICAL ENGINEER: Graduate. Age 49. Broad experience in melting, forging, rolling, and heat treating steel, and manufacture of finished steel products. Has held positions as general manager, works manager, consultant, and metallurgical engineer. Recently completed South American contract. Desires responsible management or consulting position. Free to travel. Location immaterial. Box 11-110.

RESEARCH DIRECTOR: Metallurgical chemist with broad experience in metal finishing, electroplating, corrosion, ferrous and nonferrous metallurgy, and quality control. Seeks equivalent position. Box 11-115.

METALS TECHNOLOGIST: Age 36. Academic and 14 years diversified experiences. Inorganic chemical, nonferrous metallurgical, metals finishing background. Alloy development, silver brazing and flux researches, corrosion problems. Specification electrodeposits precious and platinum group metals. Chemical analysis, metallurgical testing, metallography. Southern Connecticut or New York City areas preferred. Box 11-120.

PHYSICAL METALLURGIST: Available on consultation basis in all phases of metallurgy, preferably in Michigan, Ohio, Illinois areas. Over ten years varied experience in ferrous and nonferrous fields. Author of numerous scientific publications, Ph.D. degree in physical metallurgy. Associated with laboratories that have complete testing equipment—microscopic, chemical and physical facilities. Box 11-125.

METALLURGIST: Age 37. Twelve years diversified metallurgical work. Three years dressing complex ores; two years metallurgical inspection, all types; two years supervisory foundry control in large steel foundry; five years senior analytical chemist and fine copper casting observer. Desire process control. Prefer West. Box 11-130.

Lost & Found Dept.

A valuable camera was left in the suite occupied by Lindberg Engineering Co. at the Statler Hotel in Detroit during the week of the National Metal Congress and Exposition. The claimant should mail a complete description of the camera to L. A. Shea, Lindberg Engineering Co., 2448 West Hubbard St., Chicago 12, Ill.

Four Chapters at Chattanooga Barbecue

The Annual Barbecue of the Chattanooga Chapter A. S. M., Held Aug. 25 at Camp Columbus on Chickamauga Lake, Was Attended by Members and Guests of Chattanooga, Atlanta, Birmingham and Oak Ridge Chapters. Front row, seated, are F. F. Ford, chairman, Georgia Chapter; R. Lorentz, chairman, Chattanooga; M. F. Weidl, secretary, Georgia; W. C. Jeffrey, chairman, Bylaws Committee, Birmingham. Back row are R. G. Raudebaugh of Georgia; E. C. Miller, chairman, Oak Ridge; Wm. Hairell, educational chairman, Chattanooga; W. T. Carey, vice-chairman, Oak Ridge; A. L. Rankin attendance and arrangement chairman, Chattanooga; and L. H. Greene, membership chairman, Chattanooga. (Reported by W. M. Thomas, Chattanooga Secretary)

A.S.M. Review of Metal Literature

(Continued from page 48)

148-V. Niobium and Tantalum in Modern Industry. *Mines Magazine,* v. 41, Sept. 1951, p. 18, 23, 30, 33.

A survey stressing primary uses. (Cb, Ta)

149-V. Rhenium—A Rare Metal. A. D. Melaven. *Mines Magazine,* v. 41, Sept. 1951, p. 24.

Growing importance and possible applications. (Re)

150-V. Aluminum—a Metallurgical Marvel. J. C. Pierce. *Compressed Air Magazine,* v. 56, Oct. 1951, p. 256-262.

History of its growth and applications in industry. (Al)

151-V. Recent Metals and Alloys. A. G. Quarrell. *Engineering,* v. 172, Sept. 14, 1951, p. 343-344; Sept. 21, 1951, p. 378-379.

The availability of various nonferrous metals and alloys. Applications. Effect on composition of existing austenitic alloy steels, Cu alloys, and cast irons of addition of nonferrous elements. Progress made in the field of magnetic materials. (EG-a, AY, Cu, CI, SG-n)

152-V. Properties and Uses of Zinc and Its Alloys. W. H. Dennis. *Mine & Quarry Engineering,* v. 17, Oct. 1951, p. 325-327.

A survey. (Zn)

153-V. Boron Engineering Steels. Charles M. Parker. *Steel,* v. 129, Oct. 15, 1951, p. 76-79.

Properties and applications. (AY, B)

154-V. (Pamphlet) **Haynes Alloys for High-Temperature Service.** 1950, 96 pages. Haynes Stellite Div., Union Carbide and Carbon Corp., Kokomo, Ind.

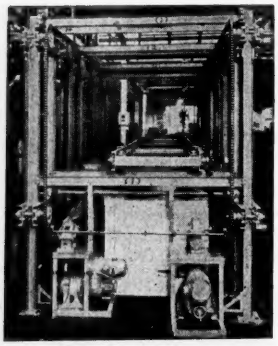
Purpose is to give engineers and metallurgists data that will serve as a useful guide in the selection of alloys for service at high temperature. It includes Co-base, Ni-base, and Fe-base alloys. (Co, Ni, Fe, SG-h)

155-V. (Book) **Hartmetalle: Werkstoffbearbeitung, Entwicklung, und Anwendung der Hartmetalle.** (Hard Metals: Industrial Processing, Development, and Application of Hard Metals.) Eugen Hirschfield. 264 pages. 1949. Schweizer Druck und Verlagshaus A.G., Zurich, Switzerland.

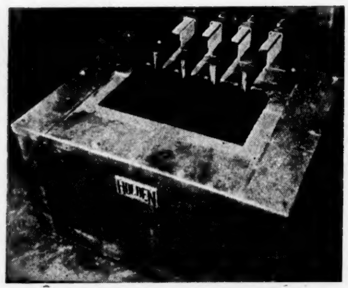
Part I: Basic factors of machining, such as cutting resistance, cutting temperature, and cutting time. Part II: Hard metals as such; powder metallurgy and properties of hard metals. Part III: The various uses of hard metals. Part IV: Problems which arise in connection with their use. (G17, H general, EG-d, SG-j)

HOLDEN POT FURNACES AND CONVEYORS

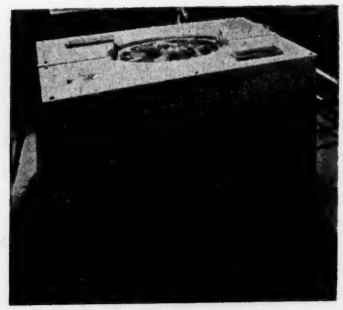
APPLICATIONS – Hardening . . . Annealing . . . Descaling . . . Martempering . . . Austempering . . . Isothermal Annealing and Descaling . . . Stainless Steel Descaling (Sodium Hydride) . . . Sand Removal . . . Bluing . . Blacking . . . Carburizing



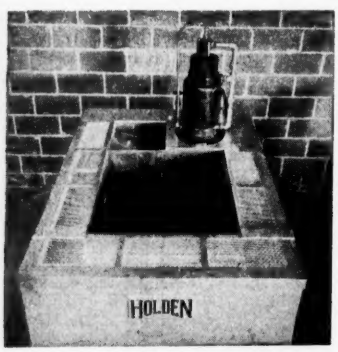
HOLDEN Electrode Furnace with Automatic Conveyor



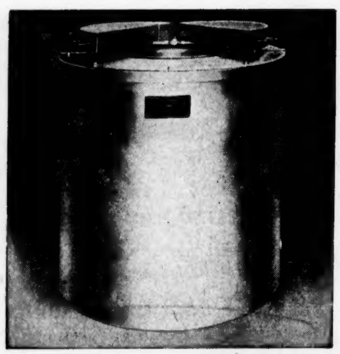
HOLDEN Electrode Furnace



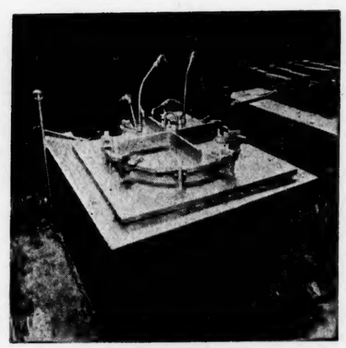
HOLDEN Gas-Fired Furnace



HOLDEN Marquenching or Austempering Furnace—Gas or Electric



HOLDEN Electric Resistance Furnace



HOLDEN Liquid Nitriding Furnace

THE A. F. HOLDEN COMPANY

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Detroit 27, Michigan